AN OUTLINE OF THE HISTORY OF THE PIPE ORGAN

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THE ORGAN LITERATURE FOUNDATION
Braintree, Massachusetts 02184

AN

OUTLINE

OF THE

STRUCTURE OF THE PIPE ORGAN,

DESIGNED FOR THE

GENERAL INFORMATION OF ORGANISTS, CHURCH COMMITTEES, AND MUSICAL STUDENTS,

WITH ILLUSTRATIONS.

BY

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AUTHOR OF "SHORT VOLUNTARIES FOR THE ORGAN," "NEW METHOD FOR REED ORGANS," ETC.

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PREFACE.

The following pages will be valuable to the organist or church committee, in giving an outline of the details of construction as pursued in modern pipe organ building, the general principles here given being adopted as a standard in the United States.

A careful perusal of the contents concerning the mechanism in connection with an examination of the interior of a large organ, will make it practical and fully comprehensive. Although prepared in the office of an extensive church organ manufactory, no allusions of a personal nature will be found in any of the pages.

The list of organ pieces which have been recently performed at public organ recitals in Europe and in this country, will be found of especial interest to the organist in selecting his repertoire. The specifications have been prepared from many years' experience with tone combinations, and are graded from the smallest effective single manual organ without pedals, to a schedule of colossal magnitude.

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ILLUSTRATIONS.

THE CHURCH ORGAN.

Open are thy golden mouths, ever waiting to incite
Songs of praise, which raise the soul up from earthly strife and blight;
May thy myriad voices e'er with angelic tones unite.

As the Sabbath morn returns, let thy harmonies inspire
Those who long for nobler lives, with devout, sincere desire;
At the solemn vesper hour, breathe response to Heaven's choir.

Softly swell thy distant notes, like a seraph's hymn above;
Soaring with thy thrilling power to the highest Throne of Love,
Trembling now in sweetest strains, as descends the Spirit Dove.

And when mourners tread these aisles, and their aching hearts are sore,
Comfort give in soothing chords; calm their grief, and peace restore;
May thy dreamy, mystic waves, bear them toward th' Eternal Shore.

When before the altar, stand those who pledge their marriage vow,
Join in tender unison with thy diapasons low;
Bursting forth with joyful sounds, let thy trumpets gladly blow.

May no loose and trifling touch, taint with desecrating hand
Keys that ope' celestial streams, flowing on so full and grand;
Thee we consecrate to Faith, emblem of the Better Land.

Consecration of the Church Organ.

On entering an edifice consecrated to divine worship, after the altar and its arrangements have engaged the attention, the most conspicuous object with which cultured minds are familiar, is the noble organ, with its array of attractive pipes, standing in the choir gallery, or near the sacred desk, as an auxiliary in leading the thoughts from material things to the realities of the world beyond the present life.

If the case and decorations of the instrument are in symmetrical correspondence with the other embellishments of the room, the eye is gratified, and if the keys and stops are guided by the hands of one who is inspired with his dignified art, the sense of hearing becomes the means of touching the emotional nature with those feelings which only the solemn organ tones can move. How desolate to the sensitive musical spirit is the sanctuary devoid of such an aid! Prejudices which many religious denominations have held against instrumental music in the past, are rapidly disappearing, and congregations whose numbers justify the expense of a worthy edifice, include the organ as one of the essential attributes of a fitly furnished church, where praise shall resound, with voices attuned to the rich diapasons, and borne along with full pervading basses, as deep in tone as the ear can perceive, stirring the soul with a sense of the grandeur of choral music.

Approaching the key-desk of the organ, two or three sets of keys are seen, with engraved knobs on either side; also sets of keys which the organist operates with his feet. These different rows of keys represent the general divisions of the interior of the organ. The keys have the general name of *claviers*. The claviers for the hands are called *manuals*, and the clavier for the feet is called the *pedal clavier*. If there are three banks of keys, the middle set is called the Great Manual, and the loud or chorus stops* are placed on the wind-chest in which are the valves operated by these keys, called the Great Chest, located immediately back of the front pipes in the center of the case. The front speaking-pipes give forth their tones by means of conductors which convey the air from this wind-chest.

The upper bank of keys is called the *Swell Manual*, the keys of which act upon the valves of the swell wind-chest, the pipes of which are inclosed in a tight compartment called the *swell-box*, with shades or folds in front, operated by means of a crescendo pedal with the right foot, the tones of any set of pipes therein being caused to apparently increase or diminish, and thus the expressive power of the organ is produced.

The Swell Chest is located at the rear, and generally overhanging the Great Chest.

*By a *stop* in an organ is meant, by common usage, a set or rank of pipes producing a similar quality of tone throughout. The name *Register* is used by some to indicate the same meaning, and is considered more definite.

The lower manual is called the Choir or Solo Organ. The wind-chest is placed back of the great chest, on the same level, with a passage board between. On this wind-chest the more delicate-toned and solo stops are placed. In rare instances the position of the swell and choir manuals is exchanged.

The Pedal Clavier and the stops belonging to it is called the Pedal Organ, and the wind-chests are placed at the back and each side of the interior works.

When there are two manuals, the upper bank is called the Swell Organ and the lower bank the Great Organ. When there are four manuals, the upper bank is called the Solo Organ, the third the Swell, the second the Great, and the lower the Choir Organ.

These are the general divisions of the works of a large pipe organ, but the internal location of chests and arrangements of mechanism depend upon the dimensions of the space and location of the manuals allotted, which vary so much in different edifices that no two organs are built by contract entirely similar throughout, the particular position of the various parts determining the cost in regard to its mechanical construction.

Architects are always willing to adopt any suggestion regarding the requisite space and location for the organ, provided it comes in season not to disarrange their plans.

THE POSITION OF THE ORGAN.

The laws of sound are analogous to the laws of light, being similarly reflected and diffused; therefore the best position to be chosen would be at the center of one end of the audience-room, where the sound could be diffused in the room itself, unfettered, and not placed in a chamber or recess. This desideratum is seldom attained in modern structures, on account of the limited space at command.

In Roman Catholic churches the organ is generally placed in a gallery at the end of the room, opposite the altar. In the Episcopal churches it is quite customary to locate it in an organ chamber on one side of the chancel. In many Protestant churches it has of late years been a popular location to place the organ and choir gallery in the rear of the pulpit. In the latter instance there should be a space between the organ floor and the main floor of the room for a circulation of air, which is generally obtained by having the organ floor elevated enough to make a ceiled passage way underneath; otherwise, when the floor of the church stands immediately over the

cellar, there is danger of the works of the organ becoming injured from the cellar dampness.

A recent introduction in Baptist churches, where the baptistery is in the audience-room, is to incorporate the baptistery and organ, locating the key-desk in the body of the room, in front of the pulpit, with the organist facing the pulpit, the action work passing either under the baptistery or at the sides, and beneath the pulpit platform. The action mechanism is necessarily more expensive when so extended, requiring the intervention of the pneumatic action to overcome friction and to secure lightness of touch, and requires more care than when direct.

An organ placed in a recess loses somewhat in power, but gains in smoothness of effect. If the instrument must be so located, the openings into the church should be as high and ample as possible, with no space above or beyond the sides of the opening to hold the tones back, which would destroy the pervading effects of the pedal pipes and impair the general sonority of the instrument. A common but unfavorable plan, when an instrument is placed in a recess, is that of filling the entire arch above the belt with front pipes, the only opportunity for the tone to escape into the church being through the interstices of the front pipes, not more than half the power of an organ so arranged being heard in the church.

Organs are frequently divided, with two cases, where it is desirable to show an elaborate window.

The instrument should not be placed where drafts of air from the outside will blow through it, which would throw it constantly out of tune, nor in a recess like that of a church tower, where in winter the air would be colder than in the auditorium. When an organ is placed in the bell tower containing a heavy bell, the jar from the ringing has a tendency to put the reeds out of tune and slightly derange the mechanism.

There should be no window back of or on the sides of the organ. If there has been one previous to the construction of the instrument, it should be tightly boarded with matched stock, so that snow or rain can not get through in case the glass should be broken.

The tones of an organ are more equally distributed from a raised position than from a low one. When not located in a gallery it should stand not less than four feet from the main floor of the church. An instrument located at the side or in the transept will not distribute the tones so well as from a central location.

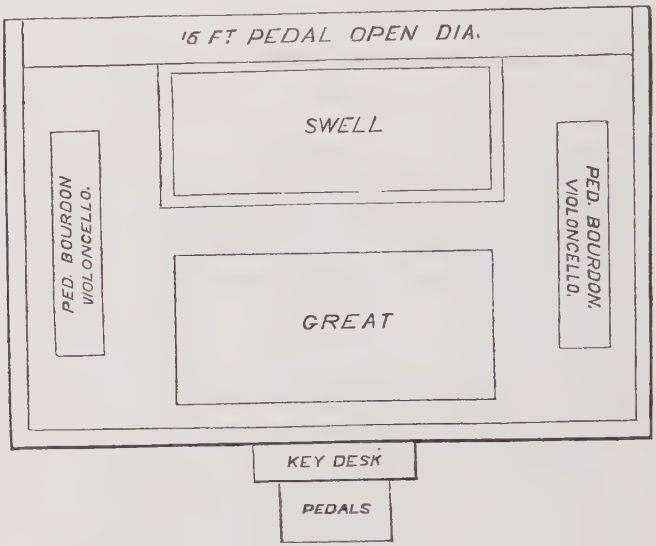
The organ builder seldom has ample room to build the organ he has contracted for, as it should be, and as a consequence the wind-chests are too small, the pipes so compact that their speaking room is impeded, and the general mechanism is likely to be crowded so that it is difficult to get at it in case of derangement. If the organ is to be a two-manual instrument, enough depth should be allowed to place the swell wind-chest back of and upon the same level as the Great Organ wind-chest, so as to bring the pipes of each in the same strata of temperature, and thus remaining in better tune with each other.

The best arrangement for a two manual organ is with the sixteen foot Pedal Open Diapason in the rear. This set of pipes of twenty-seven notes, placed side by side, requires a space of not less than twenty-one feet, leaving the mouths unobstructed. This would require a width of case twenty-one feet inside; but as such a width is rare in two manual organs, the pipes of this stop are generally doubled by placing those in the front rank on longer feet, the other pedal pipes being arranged on the sides.

Allowing an average of six inches of space for each manual stop, in the width of the wind-chests, with eighteen inches between them for a passage-board, and six inches for the thickness of the stock of swell-box, eighteen inches for the depth of the lowest, sixteen feet open Pedal pipes, added to eight inches for space between the great wind-chest and the inside of the case, and the requisite depth of space for the organ may be determined. If the action is to be direct, the key-boards, pedals, and organ seat will occupy a space of five feet wide and three feet projection from the center of the case.

The manual wind-chests should not be less than eight feet in length (ten feet would give the bass and tenor pipes more speaking room), and divided alternately—C on one end, and C sharp at the other, bringing the smaller pipes in the center, and the heavier pipes where their weight is supported by the building frame.

The adjoining diagram illustrates the best position of locating the different wind chests for schedule No. X, at the end of the book, where there is ample space:



(*Fig. 1*)

POSITION OF THE KEY-DESK.

The most advantageous location for the key-desk is at the center of the front of the instrument, as the mechanism then makes the most direct connection with the valves and slides, and therefore, with the least friction or liability of derangement from atmospheric change. It may also be located on the left side of the organ case, with the wind-chest's end to the front, the bass pipes being arranged on the inside end, the pipes placed in semi-tonal order, with the smallest pipes toward the front of the case, the pipes being arranged in the same order as the manual keys, the action-work radiating direct to each valve of the manual chests. In some churches reversed action is desired, with the key-desk detached from the case, so that the instrument is behind the player, the action-work passing under the platform on which the pedals rest. The hight of a key-desk thus detached is about four feet from the pedal platform, which requires sixteen inches of clear space for the action-work to pass under. Regulating screws are placed either on the action bars or key-frame, to change the key-dip, when the condition of atmosphere causes it to be too shallow or deep. The standard depth should be half an

inch; less than this depth will not open the valves sufficiently in the full organ.

When the key-desk is at considerable distance from the organ, the intervening assistance of pneumatic action is introduced to take up the sag of the action-work, which, as the distance is increased, becomes so great that the ordinary key-dip would not open the valves of the chests. When the organ is in the rear of the pulpit, the key-desk is sometimes placed in front of the platform, and sometimes one side of the speaker's platform.

In the latter instance, the action-work usually runs under the pulpit platform, and is then carried by angle bars and elbows at right angles, to the interior of the organ. This is quite an expensive location for the key-desk, and requires more attention to adjust and keep in order than the direct action.

By the introduction of electro-action, the key-desk may be located in any position in the audience-room, and not be subject to atmospheric changes in the operation of the mechanism, the insulated wires from each key and draw-stop to the magnetic armament being wound together in a cable of only an inch and a quarter in diameter. If used for congregational singing, the organist may be seated in the center of the room, or at the opposite side or end of the church. In large Roman Catholic churches, where an altar organ is desired to accompany the voices of the priests, a simple key-desk located within the chancel, attaching by another series of electric wires, connected with the large organ, will serve the purpose.

With a large concert organ for a music hall, two separate key-desks may be used for two performers, without additional expense in the interior action-work.

As an armament is requisite for each key and draw-stop, with intervening mechanism to open the valves, the expense is much greater than in ordinary organs, but it is often found highly practical, and the response is instantaneous, without regard to the distance between the organ and the organist.

THE FOUNDATION FOR THE SUPPORT OF THE ORGAN.

This is the first important matter for the architect or church authorities to attend to, after the position for the organ has been decided upon. The floor joists should be well seasoned, of heavy stock, at least two by twelve inches, which should be supported in the center by special cross pieces resting on posts running to stone

bases placed in the earth below the frost line. These should be placed near enough together to receive the general weight of the organ, the builder of which will always furnish a diagram indicating the points bearing the greatest weight. The joists for the support of the organ should be entirely independent of the other floor timbers of the church, as the presence of a large audience is apt to spring the floor, and otherwise would derange the action-work. Where the action is extended from the case, and the key-desk rests upon the floor of the church, it is not unusual for the presence of a large congregation to so affect the floor timbers that the keys will hardly open the valves, from which fact, when the action is thus extended, the supports for the key-desk and action-bars should also be independent of the church floor timbers. An organ with part of the action distributed on two floors is not always reliable in its mechanical working, as such floors are differently affected by changes of the climate, weight, and other causes.

These precautions concerning the foundation will be duly appreciated when it is understood that a large three-manual organ weighs from ten to twenty tons, and the momentum of the heavy bellows, when full detached chords are played, increase the liabilities of settling. If the choir is designed to consist of a large number of singers, the choir gallery floor should be independent of the supports of the organ. The largest organ thus far constructed is estimated to weigh one hundred and fifty tons.

THE ORGAN CASE AND EXTERIOR DECORATIONS.

The case in itself constitutes a part of the church furniture, and does not enter the musical value of an organ any further than it affords free egress for the tones of the pipes within.

The sympathy which exists between the senses of hearing and sight is so closely allied, that a noble organ, as a work of art, is worthy of an imposing and dignified dwelling; but where the means to be invested are limited, and as much in musical value as possible is to be obtained from the money, the simplest design is for neat, panelled wood work of such material as shall be selected, as high as the belt or impost upon which the front pipes stand, which latter may be symmetrically grouped in organ-like design. The sides to a case thus formed may be either of blind or lattice-work, or of the wood sub-bass pipes symmetrically arranged and tastefully orna-

mented. Where the organ is placed in a recess, the walls form the sides.

Where no case is desired above the belt, the greatest amount of power can be obtained by arranging the pipes in alternate order with C at the left and C sharp at the right, the smaller pipes approaching the center, each pipe standing over its own wind-channel on the chest, and the more exposed pipes ornamented. In this way none of the power is obstructed, and its diffusion of tone is much enhanced. But when the organ is placed back of the pulpit the eye is better satisfied with more ornate work.

The belt or heavy moulding on which the front pipes stand should not be less than six or seven feet above the floor where the pedals rest. If the belt is too low the pipes nearest the organist are apt to sound windy and harsher than the effect intended to be produced in the church, as he would be likely to hear the wind rushing through the conveyances to the front pipes, and if the first rank of pipes (generally the Open Diapason) on the wind-chest is strongly voiced, the sound of the air passing through the flues and impinging against the upper lips will often cause the tone to seem unpleasant, while in effect the stop will be of a rich, robust quality away from the organ; whereas, if the belt is high enough to act as a shield between the direct line of the mouths of the inside pipes and the ears of the player, he will more correctly judge of the tones of the organ as it sounds to others more remote; and yet the belt should not be higher than the top of the Great Organ pipe-racks, but a little lower than the mouths of the inside pipes. Where an organ is divided, having two cases, so as to show a window, and the player sits within the opening, these unpleasant effects are even more apparent, as he is virtually within the organ. In this position its power to him is greatly increased as compared with its effect to the audience, and in accompanying a choir he will hardly use enough power to support the voices, if governed by the effect produced upon his own hearing.

The front pipes are arranged so as to present a symmetrical appearance, according to their length and diameter. When C is placed on one side, C sharp is placed on the other side. When C is the middle pipe, then C sharp is placed on one side and D on the other, and so on with the other pipes belonging to the scale.

When a church is built in a special order of architecture, the design of the case is generally drawn by the architect of the building, and furnished by the church committee to the organ builder.

Where the specification contains an 8 ft. Open Diapason, without a 16 ft. Open Diapason in the Great Manual, the hight of the arch for the longest pipe may be from ten to fourteen feet in the center, above the belt, the largest pipe having a diameter of from six to seven inches. Seventeen pipes are generally used from the 8 ft. Open Diapason; and five from the 4 ft. Octave or Principal, the diameter of the smallest pipe being three and one-quarter inches, and the length of the shortest, including the foot below the mouth, should not be less than five feet. The length may even be twice as long, as the back of front pipes for tuning purposes have openings cut in them above the speaking point. There would then be twenty-two speaking pipes in the front of the case from the great manual, the remainder being taken from the pedal Violoncello, or silent imitative pipes inserted.

Where the specification has a 16 ft. Double Open Diapason through in metal in the Great Manual, twenty-nine additional pipes from this stop may be used for fronts if desired. With this stop the hight of the arch above the belt may extend from twenty to twenty-five feet, and the diameter of the longest pipe will be eleven or twelve inches.

The length of the foot of a front pipe does not affect the quality of the tone. Long feet, if the arches of the case are of sufficient hight, have a more pleasing effect than short feet. Front pipes are generally made of heavy zinc, with "bay leaves" or mouths of pipe metal in pointed gothic form.

The most simple, organ-like and durable ornamentation is for the body and foot of the pipe to be laid with pure nickel leaf, the bay leaf with gold, the dividing line between the gold and nickel being made with fine black lines. If the tops of the pipes are exposed to view, a simple band of gold or bronze at the top gives a neat finish.

A very rich color ornamentation is done with blue, maroon and velvet flock, the colors separated with narrow stripes of gold. The time-honored usage of covering the whole exposed front pipes with gold leaf is quite obsolete, but the custom of decorating them with fresco designs in gold and oil colors is much in vogue.

Where the price is not limited, the fronts are made of burnished block tin, which being necessarily heavier than zinc to withstand their own weight, added to the cost of the material and double the price for the labor of making them, brings the expense quite high. When tarnished in the course of time they can be repolished.

These matters of front pipes and ornamentation do not affect the quality of tone or the musical value of the organ, being simply items connected with the exterior decoration.

The interior mechanical work will be treated of somewhat in the same order which is pursued in setting up an instrument in its final position in the church.

THE INTERIOR OF THE ORGAN.

THE FRAME-WORK.

The *Ground Frame* consists of strips of light wood six inches wide and seven-eighths inch thick, connected together in the general outline of the interior works with ties interlacing at the necessary places. This frame-work rests flat upon the organ floor, which must be perfectly level, and receives by dowel-pins each post and stay which supports each part of the mechanism of the instrument, and serves also to locate the exact position of the works when finally re-set in their permanent position.

The *Building Frame* supports the wind-chests and heavy work of the organ. It should be made of hard, well-seasoned wood, and the joints so made that it will bear its intended weight without straining or sagging. It should be fastened at its different joints with iron lag-screws, brought tight with a wrench, or with tenons and hard wood pins, and should be so stayed that there is no possibility of shaking, giving the utmost firmness to bear the heavy weight of the pipes.

THE BELLOWS.

This is the general name for the mechanism which collects and distributes the air to the various parts of the organ. They should be made of clear, well-seasoned materials in the wood work, the folds made with inverted ribs, and double leathered. The simplest arrangement is as here illustrated, with two feeders operated by a working-beam, when blown by hand:

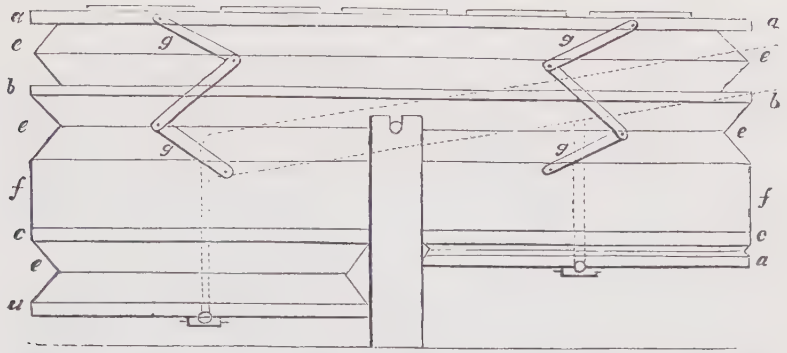


Fig. 2.

aa Represents the top-board of the reservoir, a stout frame-work covered with panels leathered and screwed on, so as to get at the inside readily if the valves ever need readjusting.

bb, The middle-board, dividing the upper ribs from the lower.

cc, The bottom-board, a stout frame-work covered inside with leathered panels. In these panels are the valves for receiving the wind from the feeders and holding it in the reservoir.

dd, The feeders.

eeee, The ribs, joined by leather inside and out, and at the ends, called "gussets."

ff, The box to which the wind-trunks are attached, which convey the air from the reservoir.

gg, Are the "lifters" which raise the middle-board.

The feeders are so made that they can be taken off at any time. Where they are worked by hand-power they are generally diagonal, one end being hinged in the bottom-board, and the other end free, moving about one foot in its operation.

Rotary motion is obtained by using three feeders, moved by means of a shaft, cranks and balance-wheel, the feeder cranks being set at equal angles. This arrangement is an improvement on the simple working-beam method, as it insures more steadiness in the wind supply, and the cost is necessarily increased. When the wind is to be supplied by mechanical power, with either a steam or hydraulic engine, square feeders are often used, which move equally up, the power being applied at the center, double the quantity of air being furnished with each stroke as compared with the diagonal feeder.

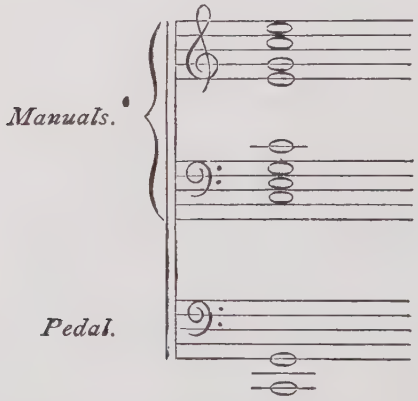
In very large organs the tone is more steady if the reservoirs are near the wind-chests, the feeders being at a more remote distance,

sometimes even in the cellar of the church, using air which is brought from the audience-room through a large conductor.

Where there is sufficient water pressure, as in cities containing water-works, large organs are generally blown by hydraulic motors. Among the many in use, those which give a rotary motion are superior when attached directly to the bellows, on account of noiselessness of operation; but if the feeders are detached from the bellows, the noise of operation is not so perceptible with the reciprocating engine as when attached direct.

Modern improvements have generally rendered the wind supply imperceptible in the audience-room, and the convenience to the organist in his necessary practice, in having a ready power always at command, is inestimable, and after the first cost of attachment the annual expenses of blowing are much less to the church than when hand-power is employed.

The size of the bellows should be ample to sustain the supply of wind with every stop drawn (excepting the Tremolo), in the following chords, including also the couplers:



A bellows which will sustain the wind on these chords, while operating, for the duration of one minute, will be adequate for the size of the organ, as legitimate playing can not at any time use a greater amount of wind than thus represented.

The wind is distributed to the chests through the wind-trunks by means of weights placed on the top of the reservoir. A fixed pressure is given, so that the wind shall enter the pipes with the same uniform force as when they are "voiced."

A little instrument called the *anemometer*, or wind-gauge, is used to determine the precise pressure. It consists of a glass tube bent twice, in which water is poured, forming two columns, both rising the same hight. When the wind pressure is applied to it one column rises, while the other is depressed, the distance between the two columns being varied according to the weights on the bellows. The usual measurement is a distance of three inches between the columns of water. Thus an organ is said to be voiced and tuned to a *three inch pressure*, as exhibited by the anemometer.

Very large organs, with more than one series of bellows, have the pressure varied in different departments.

For the three-inch pressure, weights amounting to about ten pounds to each square foot of the surface of the reservoir are required. The best weights are flat iron castings an inch thick by twelve inches long and eight inches wide. To save expense, stone slabs are used, but iron is more preferable, as it saves room and is less liable to be moved out of place.

THE WIND-TRUNKS.

The compressed air is conveyed to the various departments of the organ by means of large rectangular wooden tubes, called wind-trunks. They must be of ample size to give a steady supply of wind without the tone being agitated when detached chords are played with the left hand, and so that the strength of the pressure shall not be lessened by the friction of the air. In small organs, the wind-trunks should as an average be equivalent to seven inches square inside, and in larger instruments from twelve to fourteen inches, varying in width and depth according to the location. Where the wind-trunk is short between the reservoir and wind-chests the tone will be steady; but when it is long, and with bends, the elasticity of the air causes an unsteadiness in the tone, which must be obviated by the use of *concussion-bellows*, sometimes called "winkers," or by an elastic diaphragm. This is attached to one side of the wind-trunk, and collapses or expands, keeping an even pressure of the wind.

The wind-trunks should be made of inch clear stock, which should be thoroughly coated with glue-size on the inside, and put together with tongued and grooved glue joints. Where the organ is large and the wind-trunk long, the latter is separated a distance of half an inch, and joined with leather, so that as the weight of the upper portion of the organ settles, this separation preserves the joints from pulling apart and leaking.

Sectional view of a portion of the side of a Wind-Chest.

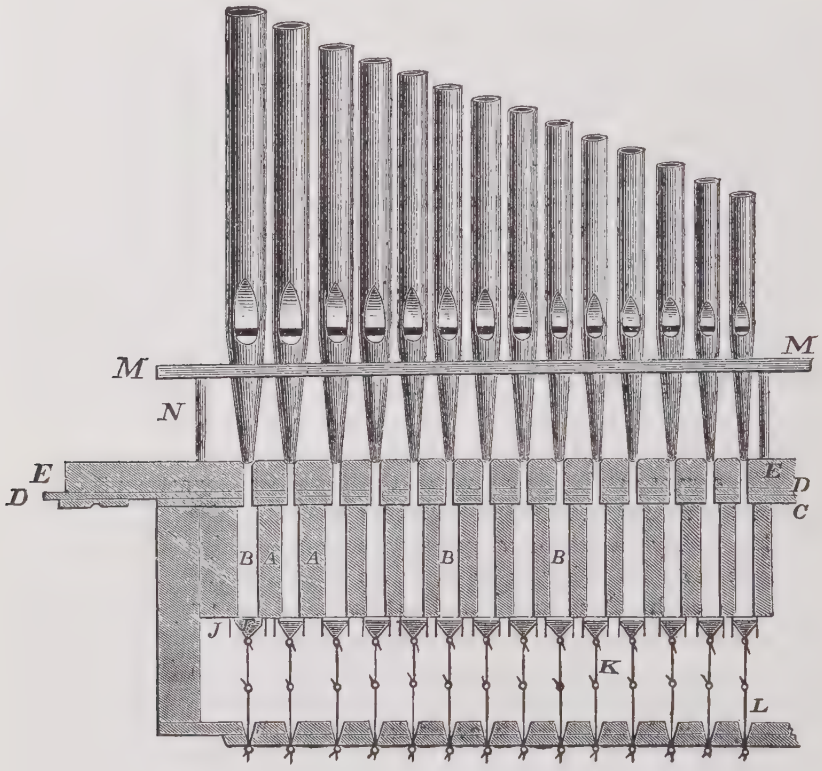
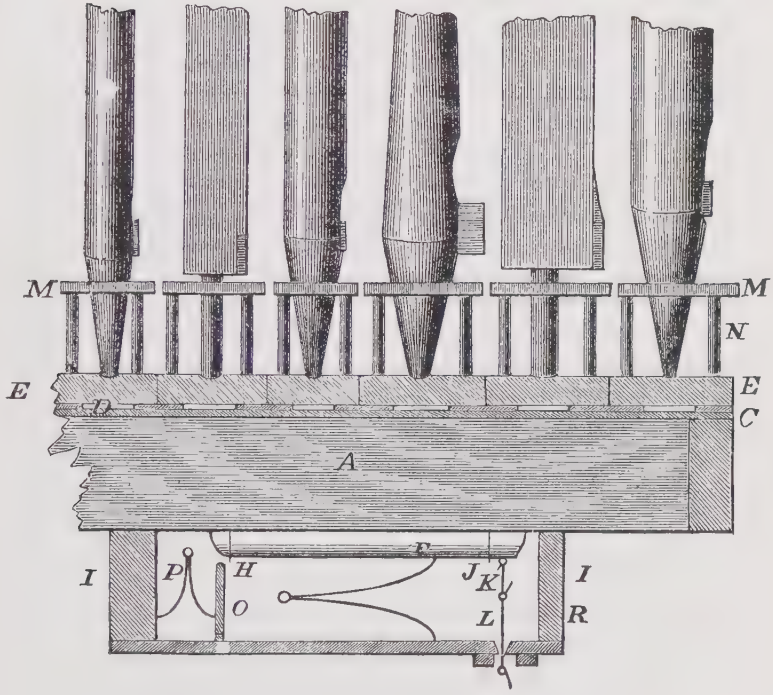


Fig. 3.

THE WIND-CHESTS.

The remote end of the wind-trunk opens into the wind-chest, into which the compressed air is received from the bellows. From this department the air is minutely distributed to the individual pipes. The length of the wind-chest in small organs is eight feet, and in large organs from ten to twelve feet, the width being determined by the number of the ranks of pipes placed upon it. The wind-chest department is divided into the Sound-Board, Table, Slides, Top-Boards, Valve Pallets and Wind-Box.

Sectional view of a portion of the end of a Wind Chest.



(*Fig. 4.*)

The sound-board consists of a strong frame-work of two-inch stock, the size of the chest and two inches in depth, divided by partitions (AA, Figs. 3 and 4) of varied thickness, into as many channels (BB) as there are keys at the manuals, the bass partitions being thicker and channels wider than with the treble stone.

Surmounting the sound-board is the table or veneer (CC), which in process of construction is firmly glued to the frame-work and partitions, being held by numerous clamps and cauls, then inverted and large quantities of hot glue poured in each channel, the clamps not being removed for several days, until the thick glue has become solid. The table is then dressed to a perfectly true surface, the slides (DD) fitted with their bolsters, and the top-boards (EE) screwed on, and the holes for each pipe bored through into the channels between the partitions. The sizes of the holes are graded according to the amount of wind the respective pipes require. Each channel corresponds with its respective key at the manual. Thus each hole bored through in the lowest C channel (one hole for each set of pipes in each top-board into each channel) will be the entrance of the wind to the lowest C pipe when the lowest manual key is pressed. The top-boards, slides and bolsters are then removed, and the whole surface of the table is closely filled with plumbago and polished, as are also the slides and under-surface of the top-boards, so that the slides may move without friction. Small grooves are then cut between each hole in the table, and led to the outside edges, the same process being repeated on the under surface of the top-boards, to prevent any of the escape air passing to another pipe than the desired one. The bolsters, slides and top-boards are then fitted to their places on the table. The top-boards are wide enough to receive their respective ranks of pipes, and vary in width from three to eight inches.

As the holes in the slides correspond with those of the table and top-boards, when a set of pipes is desired to sound the slide is moved by the draw-stop action so that these holes correspond, and the wind is permitted to enter its respective pipe. When the draw-stop is shut off, then the slide is moved so that the holes do not correspond, and the plain surface of the slide closes the channels to the pipes.

VALVE PALLETS.

These (FF) are made of well seasoned stock about an inch thick, and vary in length from eleven to sixteen inches. The outer surface is bevelled and the inner surface is flat, and they are an eighth of an inch wider on each side than the channel which they cover. They are covered with three thicknesses of pallet leather, so that they will work noiselessly and fit their places without leaking. All the spaces between the lower edges of the partitions of the sound-board, except the opening which the valves cover, are filled with strips of wood

called the *filling*, which are glued and driven solidly into their places, and the surface thus filled, after being dressed off, is covered either with organ-leather or enamelled cloth glued closely to the wood. The pedal valves have thick felt under their leather covering to prevent noise.

Each valve is held in place and kept closed by a steel spring (G). One end of the valve is pulled down half an inch when it is opened to admit the wind to a pipe, while the other end is held in place by a pin (H) at the heel, on which it freely moves, and may at once be taken off by removing the steel spring. A movable guard is placed back of the heel-pin, held by a spring (P), which prevents the valves "jumping" at the heel.

The whole valve space is enclosed by a frame-work (I,I,I), fastened firmly to the under side of the sound-board, and closed in with a bottom board. This enclosure is called the wind-box, into which the wind-trunk opens and discharges the air from the bellows, in readiness to enter its proper channel, or pipe, by the opening of a valve. The side of the wind-box toward the end of the valves which pull down, has a moveable gate called the "bung" (R), for getting at the valves to adjust them. It is leathered on the edges, extends the length of the wind-chest, and is kept tightly in place by iron hasps. The valves are kept in position at the open end by guide-pins (V). In order to open them, there is first attached to them small staples into which are inserted double hooks of copper wire (K), at the lever end of which a straight wire called the "nipple-wire" (L) is fastened, which passes through the bottom-board or "nipple-board," through small brass plates accurately drilled to fit the wire.

Outside the wind-box, as the nipple-wires hang down, are inserted loops of dry, flexible leather to which the tracker-action is attached, thus communicating from the valves to the manual keys.

Above the top-boards are the pipe-racks (MM), supported by rack-pins five inches long. Graded holes are bored through the rack-boards according to the size of the feet of the pipes which stand in them. The larger pipes receive extra support from additional frame-work fastened near the ends of the pipes above.

There are several methods of arranging the order of the channels. The most common way is to place eight or more of the alternate lower channels at the C sharp end of the chest, thus: C sharp, D sharp, F, G, A, B. C sharp and D sharp on the right and all the other pipes in order on the C end, in semitonal order above the lower seventeen pipes.

A second method is by arranging the channels in alternate order, as C at one end and C sharp at the other, and so proceeding until the two upper pipes of each side approach each other in the center. With these two methods the pipes are the least crowded, and consequently have better speaking-room on the chest.

The third method is by arranging the channels in semitonal order from the lowest upward. This throws the weight of the bass pipes entirely on one end of the chest, and causes them to be somewhat crowded unless they are led off the chest. Where there are front speaking pipes with this method, the more remote pipes from the valves are apt to be not quite so prompt in speech.

A fourth method is by placing the bass channels in the center of the chest, with the smallest at each end. This is a more objectionable method, as it brings the greater weight of pipes at the center of the wind-chest, and renders it difficult to remove a pipe without disturbing others.

KEY ACTION.

The valves in the wind-chests are operated by means of mechanism connected with the claviers, or keys, which are made of the most thoroughly seasoned light stock, and finished with polished ivory for the naturals and ebony for the sharps, the naturals also having bevelled ivory fronts. The compass of the manuals is five octaves, of 61 notes, beginning and ending with the letter C. The lowest C of the manuals is called 8 ft. C; the second C, 4 ft. or Tenor C; the third 2 ft. or Middle C; the fourth 1 ft. or Treble C, each octave above requiring a pipe half the length of the octave below. The different octaves of the keys are thus indicated in organ work:

8 ft. octave.	4 ft. octave.	2 ft. octave.	1 ft. octave.	6 in. octave.
C_0———	C^0———	c^1———	c^2———	c^3———c^4
1st octave.	2d octave.	3d octave.	4th octave.	5th octave.

The mechanical action from the keys to the valves is made in several ways. The simplest method is with the lever or fan-frame movement when the wind-chest is constructed on the semitonal principle. Round or square upright rods called *stickers* stand upon the inside ends of the keys and are inserted at the top in one end of the levers which are arranged perpendicularly over each respective key, the other ends radiating to a position immediately under the pull-down wires of the wind-chest.

When the pull down wires of the wind-chest are remote from the keys, tracker-action is used. Trackers are thin strips of light wood, capable of sustaining considerable weight longitudinally. They traverse straight directions, the motions being transmitted in different directions by means of squares or elbows. These latter are made of two pieces of hard wood, with the grain running in different directions, and held together by a third piece of wood called a tongue, and firmly glued. (Sometimes a neatly finished brass square is used.) The squares work in a nicely bushed butt or hinge which is screwed to a bar called an action-bar. The squares may thus be removed at any time for adjustment independent of each other. The trackers are provided at one end with tapped wires for leather buttons with felt washers, to hold them in place, passing through one arm of the squares, the buttons also serving for regulating the length of the trackers for an inch. The other end of the tracker is wrapped with linen glued to the wood, and pierced with a hole with a diagonal cut for hooking to a pin in the other arm of the square, or is provided with a copper wire to be hooked into the leather joint. There are also guides provided for supporting the trackers, if long.

The manual claviers, when connected with the organ-case, rest upon a frame-work called the key-sill, which runs through to the back of the building-frame, and also forms the support of the action-bars and part of the stop-action. The action-bars are provided with brass regulating-screws at each end, which raise or lower the bars to make the key-dip the right depth to open the valves fully.

The regulating screws are sometimes placed in front, on the key-frame of each manual, and are made ornamental and plated.

When the channels of the wind-chests are in alternate or irregular order, other than the semitonal arrangement, the roller-board movement is employed. The roller-board consists of a series of horizontal rods or rollers revolving partially on pins supported by bushed studs fastened into wooden frame-work. The rollers have arms at each end, one of which is immediately under its pull-down of the wind-chest, to which the tracker is attached that opens the valve, and the other end is in communication with the key-sticker, sometimes direct, and sometimes through the intervention of a set of levers.

PEDAL CLAVIER.

The pedals are placed at a distance of thirty inches below the Great Manual keys. The naturals are nineteen inches long, half an inch higher at the heel than at the toe, and are made of light-colored hard wood an inch wide, and arranged at a distance apart of two and a half inches from center to center. The sharps are raised an inch and a half above the naturals, and are either of black-walnut or rosewood, and so formed that the toe may glide smoothly upon them from the naturals. The sharps are generally placed in a line with the sharps of the Great Manual, and the middle C of the pedals is placed in a vertical line under the middle C of the manuals. The compass of the pedals is from 16 ft. C_0 to D^0 or F^0 27 or 30 notes. With less than twenty-seven notes, classical organ music cannot be played as written.

The pedals have their own independent action to their own chests. By the aid of the coupling mechanism the different manual keys may be united at will, in the lower bass notes, so as to be played by the pedals, but the pedal-stops are not played from the manuals, as the action and valve-work of the pedal department is made larger and heavier than the manual-action and the touch would be too heavy.

The manual keys are coupled with each other according to the specifications, by means of the manual coupler mechanism, and inserted either between the claviers, or in the interior action-work.

PNEUMATIC ACTION.

As the size of the organ is increased, with larger valves and wind-chests, and with two valves to a key in the same chest, the increased surface of the valves gives a heavier resistance in the wind-pressure as well as additional spring-pressure, the touch at the manuals becomes so heavy that the introduction of an intermediate power is necessary to operate the action. Among the most successful means adopted is the pneumatic lever. It consists of a small bellows twelve inches long and three inches wide, which is instantly inflated with compressed air from the bellows conveyed by separate wind-trunks. Each manual key has its own bellows, the air being admitted by a small valve, opened on pressing the manual key. As this valve opens in the pneumatic chest to which the bellows is attached an exterior exhaust-valve closes, which holds the air in the bellows

when inflated. On permitting the key to rise, this exhaust valve opens and the bellows falls immediately.

A short arm is fastened to the top of the pneumatic bellows, forming the lever, to which the tracker-action is attached beyond, and all resistance is overcome without being apparent at the key-board.

The additional power gained is according to the number of square inches of the upper surface of the pneumatic bellows. The coupling mechanism is also carried to the other side of the pneumatic power, so that when all the manuals are coupled together so as to be played from the Great Manual, the touch is not increased in heaviness.

With the ordinary key-action, as the manual couplers are brought into operation the heaviness of the touch is much increased. By using an improved pneumatic-valve which has been very successfully introduced, much of the stiffness of the touch has been overcome, even in very large organs.

Tubular action with disc-valves is also introduced for the same purpose as pneumatic bellows. In this case, the key-action communicates directly with small valves in a small wind-chest, which is supplied with air from a special bellows weighted at a high pressure. Each valve opens into a small tube which communicates with a separate disc-valve about four inches in diameter, from which the action-work communicates to the valve-work of the wind-chest. With the tubular action, the key-desk may be placed in any position in regard to the organ, as the tubes may be curved around posts, or places where it would be difficult to run the ordinary tracker-action. With electric action, there is no resistance to the touch, as the keys have only to make a connection of the magnetic current. With these intervening powers the expense is greatly increased over the ordinary action.

DRAW-STOP ACTION.

This consists of a communication of leverages with the draw-stop rods on each side of the manuals. In very large organs the slides of the wind-chests are moved by pneumatic action, the draw-stop, or register-rod, simply opening a small valve, consequently moving very easy. The stop knobs, or register heads, are made of ebony, rosewood, tulip-wood and box-wood, with engraved ivory faces, the different colored woods being grouped to represent special departments of the instrument, such as ebony for the Great Manual stops, rosewood for the Swell, tulip wood for the Pedals, box-wood for the

mechanical registers, etc. Frequently the knobs have oblique faces turning toward the player. The Great and Choir knobs are arranged at the right with their couplers, and the Swell and Pedal knobs on the left, as there are more changes made with the registers which come under the dominion of the left hand. The register-rods are round where they pass through the bearings at the key-desk, the holes of which are bushed with felt. The knobs are commonly arranged in steps.

Where the organ contains pneumatic action, the couplers are generally operated by thumb-knobs inserted through the key-slip over the Great Manual keys. When double-acting, one knob serves for bringing "on" or "off" the coupler by means of a reversible action. When single-acting, there are two thumb-knobs placed side by side, one bringing on the coupler, and the other withdrawing it when it is pressed by the thumbs.

COMPOSITION PEDALS.

These are a series of iron levers projecting in a line just above the pedal clavier. Their office is to bring on or off certain stops, and to facilitate changes of combinations and gradations of power, without removing the hands from the keys. In ordinary sized organs, one pedal brings out all the Great Manual registers, and the other takes in all but a softly-voiced stop. Larger organs have a pedal that reduces the Full Great Organ to *mezzo forte*, also pedals to operate the stops of the Swell and Pedal Organs.

The ordinary method is by using an iron roller with arms which fit in one end of the slides on the chests, or attachments to the register-rods. Where the organ is very large, the composition pedal communicates with large pneumatic bellows which have mechanism so arranged as to give a reversible movement with the same pedal, so that one pedal will be used for *fortissimo*, which being pressed again will give *piano*. The coupler "Great to Pedal" is generally operated, in addition to the register for the hand, by a pedal with reversible movement. Another accessory in the composition work is by means of ventils or valves placed in the wind-trunks where there is more than one wind-trunk in a department of the organ.

THE TREMOLO

The tremolo effect is produced by a mechanism generally applied

to the swell department of the organ, which permits the wind to escape in such a manner as to shake the air in the wind-chest and thus give the tones of the pipes a certain tremulousness which, when properly used, imparts an emotional effect to the music.

It consists of an elastic rubber ball fastened to a lever, adjusted by regulating buttons easy of access. This arrangement is placed within a box ten inches long by six inches wide and deep, which is connected with the wind-chest by a long tubular conductor. A valve in the chest operated by the draw-stop action admits the air through the conductor to the tremolo, the air being forced against the elastic ball, which is set in motion by the escape of air through an opening from the outside of the box, which is covered by the ball when it strikes it. Its elasticity causes it to rebound, and the lever adjustments give it a steady number of vibrations, and each pulsation causes the body of air from its own elasticity to be likewise affected in the wind-chest.

THE SWELL-BOX.

This is a compartment which encloses all the pipes belonging to the Swell wind-chest, with the front arranged with a series of shades or shutters called "folds," which being opened or closed, causes an increase or diminution of the power of the pipes sounding within, thus giving the capacity for expression at the option of the organist. In large organs the swell-box is made double, with an inch of space between the inside and outside partitions, and large enough to enter and pass around the ends of the chests, with a hight inside of ten or more feet, and also provided with entrance doors and passage boards for access in tuning the pipes. In small organs but one thickness of stock is used for the partitions of the swell-box, which, if well jointed and fitted, is as effective as the double boxes of the larger organs, as there is less exposed surface to transmit the sound, and less room is occupied. The folds are arranged with cushions on the edges, so that when closed, the soft effects will be more apparent. They are arranged to work either horizontally or vertically. When made the former way, each fold is hung on an axis placed one-third from the top of its width. An arm projects a few inches from one end of each fold, each arm being in line, and connected to a perpendicular rod, which, when operated by means of its connection with a pedal placed at the right of the pedal-clavier, the folds may be opened or closed. The swell-pedal is arranged with a side drop-rod

which is connected with a ratchet, enabling the player to leave the folds open at graded distances.

When the folds are vertical, the axis is placed in the center, and the lower pivot rests upon a metalic plate, and the operation is by means of a balanced pedal made of such a shape that the sole of the foot rests entirely upon it as in a shoe, the toe opening the folds by pressing, and the heel closing them as tightly as may be desired.

The folds are made of two thicknesses of wood to prevent warping. When the width of the front requires, a double frame is made, with two series of folds, so that there will be no danger of their sagging in the center from their own weight and thus conflicting in their operation.

A modern method of increasing the expressive power of the organ is by placing the reed and mixture stops of the Great Manual also in the Swell-Box on a separate wind-chest, the Great Manual action-work connecting with it.

MUSICAL DEPARTMENT.

THE PIPES.

The construction of the pipes belongs to the mechanical department of organ building, requiring no musical faculty on the part of the workmen; but the qualities of the tones elicited in the voicing, the decision in regard to the scales to be employed, and the general balancing of the degrees of power, so that each stop will blend with the others in the most effective manner, belongs to the artistic department, and places the construction of the Pipe Organ upon a higher plane than a mere machine, making it instrumental in exciting devout thoughts and sacred emotions in the mind, from which characteristics, early in its history it was consecrated to the service of the church.

The structure of the pipes is divided into two general classes, viz: Flue and Reed Pipes.

Flue-pipes derive their name from the tone being produced by the passing of the air from the foot of the pipe through a narrow opening called a *flue* across the mouth of the pipe and causing it to speak. Flue-pipes are made of metal and wood. When made of metal they are circular in form, and when made of wood they are rectangular, triangular, and sometimes cylindrical. Flue-pipes are made of various lengths and diameters, according to the pitch and character of the quality of the tone.

The general structure of a flue-pipe is illustrated in the following sectional view of an open cylindrical pipe: (Figs. 5 and 6.)

Fig. 5.

Fig. 6.

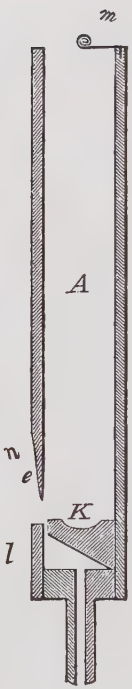


Fig. 7.

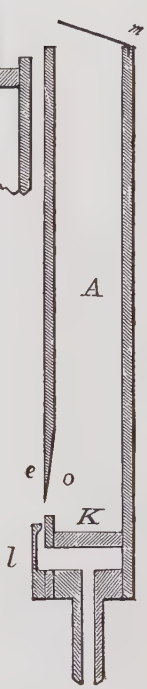


Fig. 8.

a, The body of the pipe.
b, The foot for conveying the air.
c, The mouth of the pipe.
d, The lower lip.
e, The upper lip.
f, The flue, or air passage.
g, The language, dividing the body of the pipe from the foot.
h, The toe, or entrance of the wind.
i, The ears for steadying the wind.
j, The tuner.

In the section of a wood pipe the difference is represented thus: (Figs. 7 and 8.)

k, The block.
l, The cap.
m, The tuner.
n, Exterior bevel.
o, Inverted mouth.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Metal flue pipes have the following varieties of form:

Open Cylindrical, where the body has the same diameter throughout. (Fig. 9.)

Conical, where the top of the body is of smaller diameter than at the mouth. (Fig. 10.)

Conical, with bell at the top. (Fig. 11.)

Conical Inverted, where the top of the body is of larger diameter than the mouth. (Fig. 12.)

Stopped Cylindrical, having a metal covering at the top (Fig. 13.)

Half stopped Cylindrical which have an open tube or chimney inserted in the covering. (Fig. 14.)

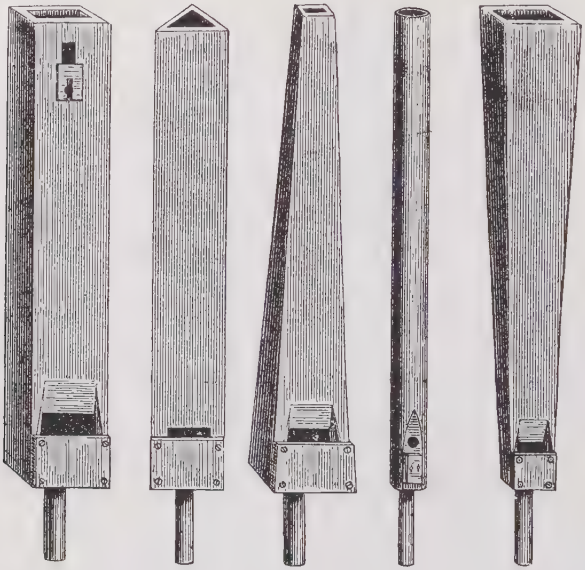


Fig. 17. *Fig. 18.* *Fig. 19.* *Fig. 20.* *Fig. 21.*

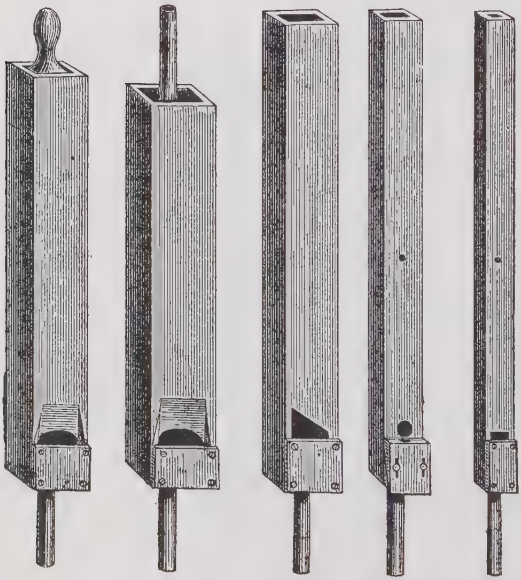


Fig. 22. *Fig. 23.* *Fig. 24.* *Fig. 25.* *Fig. 26.*

Wood pipes are divided into *Open Four-sided* or *Rectangular.* (Fig. 17.)

Three-Sided or Triangular.. (Fig. 18.)

Pyramidal. (Fig. 19.)

Inverted Pyramidal. (Fig. 21.)

Turned Cylindrical. (Fig. 20.)

Stopped Rectangular. (Fig. 22.)

Half Stopped Rectangular. (Fig. 23.)

Fig. 27.

REED PIPES

A reed pipe (Fig. 27) consists of the *body* (a) of metal, block (b) of metal, *eschallott* (c) of brass, *tongue, or reed* (d) of brass, *tuning spring* (e) of brass or steel, and *boot or socket* (f) of metal.

Reed pipes are of two kinds: the *impinging or striking reed*, as here illustrated, and the *free reed*.

With the impinging reed the air causes the tongue to vibrate on the flat surface of the eschallott, through which is the opening to the body. The vibrating portion of the tongue is lengthened or shortened, thus made to vibrate slower or faster, according to the desired pitch, by raising or lowering the tuning spring, the body of the pipe being in sympathy with the desired pitch.

With the free reed, the tongue does not strike, but is carefully fitted so that it vibrates in the opening on the face of the eschallott.

The tuning-wire is connected with a movable support of the heel of the tongue. In some cases the tuning is regulated by thumb-nuts on a threaded wire.

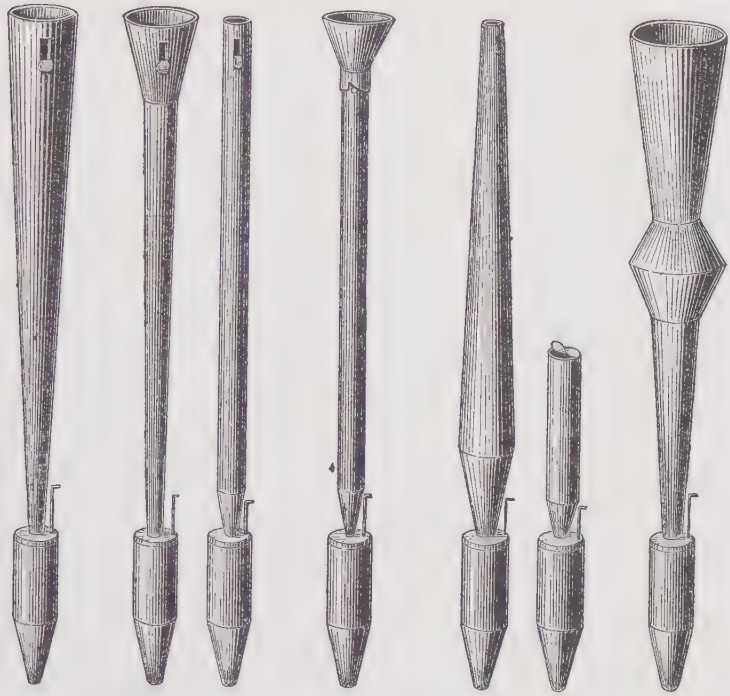


Fig. 28. *Fig. 29.* *Fig. 30.* *Fig. 31.* *Fig. 32.* *Fig. 33.* *Fig. 34.*

The bodies of reed pipes are made either of metal or wood. When of metal they have the form of

Inverted conical. (Fig. 28.)

Inverted conical, surmounted with a bell. (Fig. 29.)

Cylindrical. (Fig. 30.)

Cylindrical, surmounted with a bell. (Fig. 31.)

Conical. (Fig. 32.)

Cylindrical half stopped. (Fig. 33.)

The bodies of the lowest toned reed pipes are generally made of wood, four-sided, and inverted pyramidal, and in the largest organs are thirty-two feet long.

The bodies of the free reed pipes are generally made of wood.

THE MATERIALS FOR THE METAL PIPES.

The substance of the metal pipes consists of an alloy of block tin and lead. It is made by the organ-builder, and can not be purchased as such. The larger the percentage of tin in the composition of the pipes the greater is their durability. The common percentage is thirty-three per cent. of tin and sixty-seven per cent. of lead, and the quantity of tin is increased as the quality of the tone demands a change in the ingredients. In certain cases the metal is of pure tin, or with ten per cent. lead. The heavier bass pipes are generally made of thick zinc, to give them strength.

The pipe-metal is fused in a large melting-kettle, and when it is of the right temperature, is dipped by ladles into a *casting-box*, which consists of a stout frame-work thirty inches long, ten inches wide, and eight inches deep, provided with a movable gate on one side of the entire length. The casting-box is fitted to one end of a very solid casting-table thirty inches wide and twenty feet long, covered first with ticking and over it with fine linen. The gate of the casting-box is adjusted for the thickness of the desired sheet of metal, and when filled with the molten substance, is moved along the whole length of the casting-table, the metal flowing out from the gate of the box, and leaving a sheet of pipe-metal the width and length of the casting-table. If the composition has forty per cent. tin, as it cools, the effect of the crystalization causes the spots to appear on the upper surface of the metallic sheet, forming what is well known as "spotted metal." Different percentages of tin and lead cause the shape and size of the crystals to vary, so that experts can tell at once the value of the metal in the organ pipes. Thirty-three per cent. metal is generally planed to a smooth surface, as is also pure tin. If the amalgamation is less than thirty-three per cent., the pipes are sooner oxidized and become soft, so that they sooner wear out by the needful tuning. Experience has proved that certain percentages of tin are better for special stops, those which are string-toned being more incisive when a higher percentage of tin is used.

From the sheets thus cast, the stock for the pipes is cut out according to the scales used, shaped on mandrils, and soldered together with workmanship of the neatest execution. The bodies of the reed pipes at the most slender part are made of zinc, so that they shall be strong, and not easily bent over. The tops are of pipe-

metal, and have symmetrical incisions rolling the metal down for regulating the tone. The length and diameter of the body of a reed-pipe is so adjusted as to be in accordance with the vibrations of the reed.

THE MATERIALS FOR WOOD PIPES.

The sides and back of the manual wood pipes are made of the clearest seasoned pine, with hard wood front, of cherry or maple, sometimes with apple or pear tree. The inside is coated thoroughly with glue-sizing, filling all the pores of the wood, which tends to improve the resonance of the tone. The external surface is generally covered with transparent varnish, but they are sometimes stained and then varnished. The heavier pipes are made of clear pine, yellow poplar, or cypress-wood, and the stock must be thick enough to withstand the vibrations without the tone rolling. The larger wood pipes are tongued and grooved at the joints, which are glued together.

THE STANDARD LENGTH OF ORGAN PIPES.

The speaking length of an organ pipe is the distance from the language or block to the end; and the length varies from 32 feet to $\frac{2}{4}$ of an inch. The compass of the manual keys is five octaves, but the entire compass of pitch, with the 16 ft. and 2 ft. stops, is eight octaves; and where the pedal organ has a 32 ft. stop, the extreme compass of the organ from the lowest to the highest tone is nine octaves.

The pitch of organ stops is indicated by figures on the register knob. These figures indicate what the length of an open organ pipe would be on the lowest C of the manual to give the same pitch as the stop drawn. A pipe which is stopped or covered at the end (Gedeckt) with a tampion, is half the actual length of an open pipe giving the same pitch, the vibrations being reflected by the tampion, thus giving the effect of double the length of the body of the pipe. The tones produced by reflection are of less strength than with an open pipe, and are of a flute-like quality.

The Foundation Pitch of the manuals, is represented by an open organ pipe of 8 ft. speaking length on the lowest C of the key-board, and is represented on the staff by the second added line below, with the

Bass clef. This pitch corresponds with the tones of the human voice as represented on the staff. The 8 ft. pitch is therefore called the Unison Pitch, and stops so marked should form the foundation of all combinations for music played by the manuals. A stopped pipe four feet long would give the same pitch, and would also be called an 8 ft. stop in its pitch name.

The Foundation Pitch for the pedal organ is an octave lower than the manual pitch and is represented by a 16 ft. open pipe, or its representative in pitch, an 8 ft. stopped pipe.

Each octave higher has half the length of the pipes of the preceding octave, and in each octave lower, in descending, the pipes an octave below any given letter are twice as long. Thus, with the Unison pitch of 8 ft., the Tenor C° pipe would be four feet long (if an open pipe), the Middle C^1 pipe two feet long, the Treble C^2 pipe one foot long, and so on through the other octaves.

In organ building, the intermediate tones are called by sharps; thus, a set of pipes would be marked in the organ: C— C♯— D— D♯— E— F— F♯— G— G♯— A— A♯— B— C, and so on through the other octaves.

The Standard Length of organ pipes in pitch nomenclature is indicated by the various C pipes, viz: 32 ft.= $C_{\circ}$, 16 ft.= $C_{\circ}$, 8 ft. C_0, 4 ft.= C^0, 2 ft.= C^1, 1 ft.= C^2, 6 inch= C^3, 3 in.= C^4.

The *actual speaking length* of organ pipes to give the present established pitch is somewhat shorter than the figures indicated by English measurement, a general rule being that the pipe is of the standard length less its own diameter.

Circumstances modify the length, such as the diameter of the pipe, the wind-pressure, and its being shaded by the proximity of other pipes. A pipe of small diameter and narrow mouth requires a longer body than a pipe of larger scale. A pipe voiced to a heavy wind-pressure requires a longer body to give the requisite pitch.

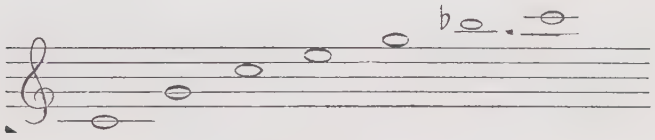
As the 8 ft. pitch represents the Unison pitch, a stop which sounds an octave higher is called a 4 ft. stop. When two octaves higher a 2 ft. stop. A stop sounding an octave lower is called a 16 ft. stop, also a Double or Sub-Octave Stop. These rules apply to the name of the pitch, whether the stop runs through the whole compass of the manuals or not.

HARMONIC STOPS.

MUTATION AND COMPOUND.

In the gradual increase of power of an organ by the addition of the 4 ft., 2 ft., and the 16 ft. stops, these being the octave, super-octave and sub-octave of the Diapason or fundamental work, the combination is somewhat thin and cutting, rather than producing the full body which the ear demands, and the introduction of other tones representing the concomitant or harmonic tones of the unison work are requisite to fill up this thinness and bind the tones together.

Every musical tone has its harmonics, whether produced by a string or wind vibration. This may be illustrated by blowing the open tones of a horn, like the cornet, without touching any valves. The key-note is first sounded. By increasing the force and diminishing the embouchure of the lips, the fifth above is next sounded, the octave next, then the third above (or tenth), then the fifth (or twelfth), then the flat seventh, and finally the second octave, viz:



The same divisions appear with a violin string in lightly touching the harmonic nodes of an open string.

The stops producing these requisite tones to give fullness are called mutation stops, which are voiced with a flute-like quality so as to blend with the other stops without being prominent. Of the mutation stops, the Twelfth (called also the Octave-Quint and Nasard) is the most commonly used. It is designated as a $2\frac{2}{3}$ ft. stop, the lowest pipe sounding the twelfth diatonic note above the 8 ft. tone, when the C_0 of the manual is played. This stop is drawn with a 2 ft. stop, after the 4 ft. stops have been added to the 8 ft. stops. As the size of the organ is increased, a stop an octave lower than the Twelfth, called the Quint or Quint-Flute, is introduced if the manual has a 16 ft. stop.

When a Twelfth is drawn with the 4 ft. Octave stop, and one note at the key-board sounded, there is a very perceptible soft resultant sound of 8 ft. pitch heard from the union of the two pipes. This is clearly apparent in the tuning of the organ.

This phenomenon is taken advantage of in the Pedal organ, where a $10\frac{2}{3}$ ft. Quint (the fifth of the 16 ft. tone) is often introduced, which in combination with a 16 ft. Pedal open Diapason of wood, produces a tone wave nearly equivalent to a soft 32 ft. stop.

COMPOUND STOPS.

As the size of the organ is increased, and reed stops of the Trumpet quality are introduced, several ranks of pipes, formed of the Harmonic tones, such as the Fifteenth, Twelfth, Nineteenth and Twenty-second, and sometimes the Seventeenth, Twenty-sixth and Twenty-ninth of the foundation tone, generally three or four ranks of pipes sounding through the same slide, or slides fastened together so as to be drawn by the same register-knob. As the pipes would become too small and shrill in quality to ascend the full scale of the manuals, they break back an octave lower at the different octaves, at such places where they will be the most effective. These compound stops are classed under the general name of mixtures, and large organs include several mixture stops. The care in the quality of the voicing of the compound stops, as harmonic tones in their blending characteristics has much to do with the good or ill effect of the Full Organ.

FORMATION OF THE TONE.

The air in passing through the flue is directed when the pipe is being voiced, so that it impinges against the upper edge of the upper lip, and giving irritation to the air exposed at the mouth, this vibration is imparted to all the particles of air within the body of the pipe, which reflect against the sides, and thereby mysteriously produce a musical tone. The air in producing the tone does not enter the body of the pipe (if rightly voiced), which may be proved by dropping the lightest down from a feather in the top of the body of the pipe while it is sounding. The light substance will immediately drop to the mouth and be blown outside; or if an attempt is made to insert a light feather in the mouth when it is sounding, it will be blown upward on the outside of the pipe. The principle of the tone formation is clearly illustrated on a very small scale, by blowing with the mouth across the hole of a common key, the sound being produced by the irritation of the blast from the mouth against the air in the tube.

THE VOICING.

This is an artistic department in organ-building, and must of necessity be under the superintendence of one who possesses the most delicate sense of hearing, whose perception of the variations of tone qualities is exceedingly acute, and whose knowledge of the capacity of the organ for interpreting its legitimate music with proper balancing and blending of power and qualities, must be based upon long practical experience with organ music. He should know the requirements of each organ for the service in which it is to be used, and his experience must be founded upon his actual acquaintance with what has been done by others in their master-pieces, in order that his standard shall be of the highest order. He should possess a thorough musical education, and a practical experience as an organist, with ability to execute the compositions of the masters of organ-playing, and thus be able to test the capacity of his work in the rendition of music which it should be able to interpret under his hands. In addition to this, he should understand all the different characteristics and compass of the various musical instruments which enter the combinations of organ stops, and a knowledge of the powers of the human voice, both in solo and chorus singing, that his instrument may be truly adapted to serve its highest purpose in every respect.

An organ pipe as it leaves the hands of the workman is not advanced far enough in structure to produce a musical tone. If it is a metal pipe, when it arrives in the voicing department, the first process is to indent the language with *nicks* which divide the sheet of air in the flue into separate currents, as it passes across the mouth. The upper lip is then cut to its proportionate hight and smoothly *skived*, and both the upper and lower lips adjusted properly. The orifice in the toe is made of the right diameter to admit the requisite quantity of wind to give the tone its desired strength. The tuning opening near the top of the body is then cut and the metal rolled down a certain distance. The pipe is then placed upon a "voicer," an organ in miniature having its bellows weighted with the same pressure as the organ for which the pipe is intended. The language is then adjusted so that the little currents shall impinge upon the upper lip and produce the desired quality of tone. Each pipe of one stop is thus gone through with, a work requiring great patience, until each has the same characteristic quality and power. The nickings vary

with different stops, some being straight, others bevelled, some coarse and others fine. The width and distance of rolling down the tuning-slit at the top of the pipe exercises quite an influence on the quality of the tone. With slim-scaled pipes the opening is narrow, and as the tuner is rolled down the pitch not only becomes sharper, but the tone of a more incisive string-like quality.

The system of tuning by rolled tuning openings at the top of the pipes is of modern introduction, and has improved not only the varieties of the qualities of tone, but it renders the pipes more durable, as they are not bruised at the top nor crushed at the mouth. Care must be exercised in not rolling the tuner down below its tuning point, for if it is rolled up again, leaving interstices at the sides of the unrolled metal, the pipe will lose its voicing.

The set of pipes with which the temperament is held are not tuned by slits, but by *coning*, as are also the smaller metal pipes.

The process of voicing wood pipes consists in cutting the upper lip to its proper scale, then cutting the flue in either the cap or exposed edge of the block (corresponding to the language of the metal pipe). The nicking is filed on the block and sometimes on the edge of the cap, and the flues smoothed and polished with black lead. Pipes like the Gedeckt have hollow blocks, like the block of Fig. 7. Pipes like the Melodia have the upper lip bevelled on the inside of the pipe, and the blocks sunk below the key as in Fig. 8. A wooden foot is inserted in the lower part of the block, and in the smaller pipes the quantity of air is regulated by the adjustment of wooden wedges, and in the larger pipes by movable gates.

Stopped pipes are tuned by depressing the tampion to sharpen, and withdrawing it to flatten the pitch. The block of the tampion is fitted to the pipe and covered with soft leather. The larger pipes have a flange of elastic rubber under the leather, so that in changes of weather the tampion will be kept in its place.

Open wood pipes of the manuals are tuned by metallic rolls or shades placed at the top of the pipe; by covering the end more the tone is flattened, by uncovering the pitch is sharpened. The larger pedal pipes have either a movable slide adjusted to the side of the pipe near the end, or have a sliding-box inserted in the end, or they are cut off a little sharp, and then a quarter of the surface is covered with a wooden tuner. Stopped metal pipes, also inverted conical pipes surmounted with a bell, are tuned by means of long, flexible ears, which are turned toward the mouth to flatten and pressed away from the mouth to sharpen the pitch.

Reed pipes require the longest time in voicing, one pipe alone sometimes requiring hours to obtain the desired quality. The reed tongues are fitted to the eschallotts, and held in the block by wedges. The free end of the reed has a peculiar curve given it, so that when at rest it is away from the eschallott. The air in entering the foot of the pipe causes the reed to vibrate against the eschallott. As the tuning-spring shortens the vibrating portion of the tongue, the pitch becomes sharper, and the tone becomes weaker. To increase the strength after the quality of tone is obtained, the tuner of the tuning-slip at the top is rolled down the desired distance, and the tuning-spring on the reed adjusted to give the right pitch, or the order is reversed as the case requires.

With 8 ft. reed stops the upper octave above c^3 is generally of open-flue pipes voiced in imitation of the reed tone, as reed pipes of so small scale would not keep in tune so well.

SCALES OF THE PIPES.

By the scale of a pipe is understood its diameter or dimensions as compared with its pitch-length. The diameter of a pipe affects the quality of tone, as also does the hight of the mouth. A pipe of large diameter has a fuller tone than one of small scale, and there is a limit to the diameter in producing the requisite tone for the organ. Open Diapasons are of the largest scale, and string-toned stops of the smallest. In a pipe of large scale, where the mouth is cut high, the tone is of a fluty quality, and requires more wind than when lower. If it is too high the tone will be unsteady, as the currents of air are apt to be dispersed before reaching the upper lip.

While the length of the pipe is doubled every thirteenth pipe (thirteen chromatic tones in the complete octave) in descending from any given letter, or half as long in ascending, one-half the diameter is found *seventeen* pipes above any given letter, or twice the diameter or dimensions seventeen pipes below.

The opposite illustration of the internal dimensions of the Gedeckt from tenor C^{o} to the e above middle c^{1} for seventeen pipes exhibits the proportion of each pipe, as followed by the pipe-maker, the lower and upper octaves being on proportional continuations of these lines, *a* to *b*, depth of the pipe, *c* to *b*, width of pipe, *d* to *b*, hight of mouth, *e* to *a*, thickness of the wood for the sides of the pipes. Each wood stop has its own scale of depth and width, according to its quality of tone, with their dimensions in the diagonal proportions of the seventeen pipes here given. Metal stops increase and diminish their diameters in the same relative proportion.

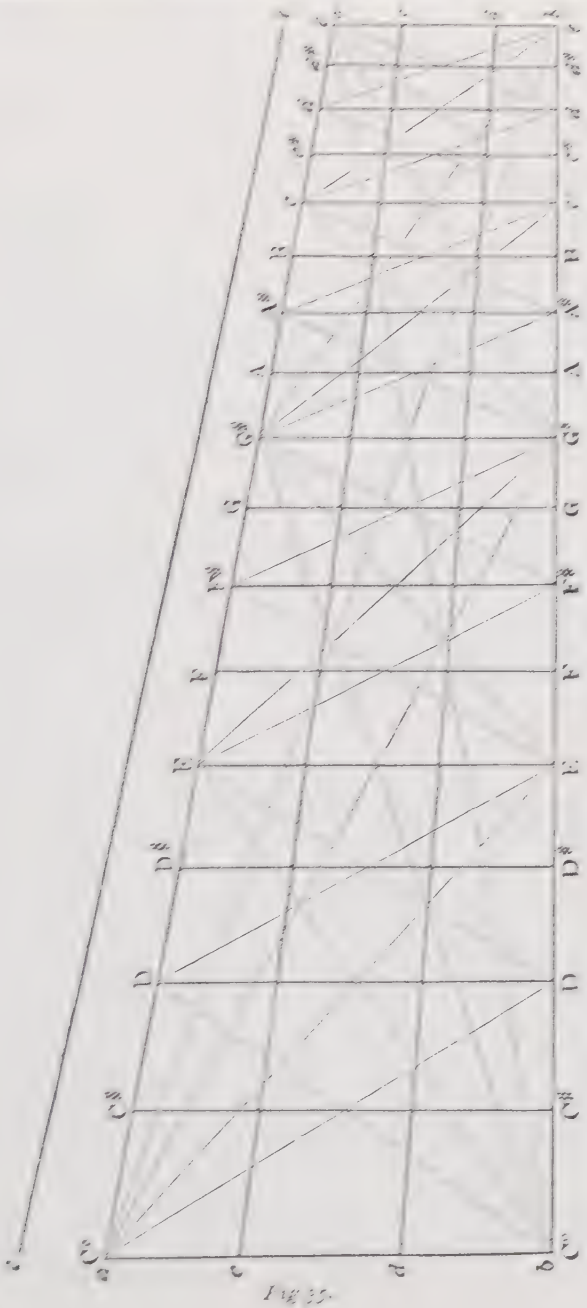


Fig 35.

THE QUALITY OF THE TONE.

The general qualities of the organ are divided into
Organ or Diapason Tone.
Flute Tone.
String Tone.
Reed Tone.

The Organ Tone is represented by the English 16 ft. and 8 ft. Open Diapason and its octave works; by the German 16 ft., 8 ft. and 4 ft. principal, and the French 16 ft., 8 ft. Montre and 4 ft. Prestant.

The Flute Tone is represented by the 16 ft. Bourdon, 8 ft. St. Diapason, Gedeckt, Melodia, Clarabella, and stops marked especially as 8 ft. and 4 ft. flutes. The actual flute quality is not carried into the deep-toned basses, which partake of the organ tone, in character, nevertheless they are made by the same scale of structure as the trebles and are classed accordingly.

The String Tone is represented by the 16 ft. Pedal Violone and Contra Gamba, 8 ft. Violoncello, Gamba, Keraulophon, Salicional, Viol d'Amour, etc.

The Reed Tone is represented by the Trumpet, Oboe, Bassoon, Clarinet, Vox Humana, Trombone, etc.

In large organs every rank of pipes is complete through the compass of the manuals. Frequently certain stops in the Swell are divided into Bass and Treble for the sake of increasing the variety of bass tones when coupled with the pedals.

In smaller organs, where the space is limited and where the price will not admit of complete stops, the Bass, or lower twelve pipes of the Dulciana is omitted, the Bass to the Melodia, which stop is for this purpose divided, being drawn to serve as a bass to the Dulciana.

The bass to some of the 8 ft. open Swell stops is also omitted, for the same reason, or continued in stopped pipes, to reduce the hight of the swell-box. It is not a good plan when a stop is not continued through the bass to have it "grooved" to the bass of another stop, thus appearing to have 61 pipes, when there are in reality only 49, as it seems to be a deception, and would be so interpreted by a severe critic. Every stop when drawn should indicate only its real number of pipes.

A complete organ has every rank of pipes through the whole compass of the manuals, a desideratum to aim for in making up a specification, to have every combination properly balanced. The

12 lower pipes of a stop cost as much as the remaining 49 above, and many music committees prefer a greater variety in the combinations, than in having a less number of complete stops—where the price is limited.

DESCRIPTION OF MANUAL STOPS IN COMMON USE.

32ft. *Sub Bourdon*, or *Manual Untersatz.* Flute tone.
This is a stopped wood set of pipes, the lowest pipe sixteen feet long, sounding two octaves below the Unison Stops, and is found only in the very largest organs, and then rarely descending below the Tenor C° of the manuals. When running through to the C_0 of the manuals the lowest pipe is $10\frac{1}{4}$ inches deep and 8 inches wide, inside measurement.

16 ft. *Double Open Diapason.* Of metal. Organ Tone.
The lower two octaves of this stop are generally made of heavy annealed zinc, and are mounted in the front of the case. They are sometimes made of pure tin, at a much greater expense. The diameter of the lowest pipe is 12 inches. The scale of the pipe is generally one pipe smaller than the 8 ft. Open Diapason. It is the same stop as the French "montre 16 ft." and German 16 ft. "Principal."

16 ft. *Double Dulciana.* Organ tone.
Soft-toned cylindrical pipes of metal, of small scale, the lower octave when running through in metal mounted in front. When not mounted in front, the lower octave is frequently of stopped wood. The trebles are fifty per cent. tin.

16 ft. *Contra Gamba.* String tone.
Metal cylindrical pipes of fifty per cent. tin, with zinc basses. This stop is sometimes made in the form of an inverted cone, surmounted with a bell.

16 ft. *Æolina.* Organ tone.
A very delicately-voiced cylindrical metal stop, generally placed in the Choir Organ. On account of the limited hight overhead, the lower octave is made of stopped wood pipes.

16 ft. *Double Melodia.* Flute tone.
Open wood pipes with inverted mouths, the lower octave of stopped wood pipes.

16 ft. *Tibia Major.* Flute tone.
Large scale stopped wood pipes with rounded mouths, amply winded. A full-toned 16 ft. Flute. Tibia is the ancient name for the Flute. In the absence of a 16 ft. Open Diapason in the Great Manual, it is very effective in giving body to the tone of the full organ.

16 ft. *Double-Mouthed Bourdon.* Flute tone.
Stopped-wood pipes, the trebles being twice the depth of ordinary stopped pipes, with a mouth on the front and back of the pipes, thus giving double the volume of sound.

16 ft. *Bourdon* or *Double-Stopped Diapason.* Flute tone.
Stopped-wood pipes used both in the Great and Swell Organs, giving solemnity to various combinations. Being an octave lower than the Unison pitch, it is not well to use it in accompanying solo voices, but in supporting a chorus, and especially a full congregation, it adds much to the dignity of the effect when used with the 8 and 4 ft. stops.

16 ft. *Quintaton.* Flute tone.
Stopped-wood pipes with low mouths, voiced so that the fifth or quint is also heard with the ground tone.

16 ft. *Still Gedeckt*, or *Lieblich Gedeckt.* Flute tone.
Stopped wood pipes of smaller scale than the Bourdon, with mouths cut high, giving it a clear tone; generally placed in the Choir organ.

16 ft. *Double Trumpet*, or *Bombarde.* Reed tone.
A sub-octave Trumpet, with zinc bodies. Inserted only in large organs

16 ft. *Contra Fagotta.* Reed tone.
A sub-octave Oboe. Placed in large swell organs, adding greatly to the effect of the full swell and in orchestral-like combinations. The lower pipes are bent with mitred joints, so that their length may be inserted in a swell-box ten feet high.

16 ft. *Euphone.* Reed tone.
Free reeds with rectangular bodies of wood, very smooth and pleasing in quality of tone, of a subdued clarinet character.

8 ft. *Open Diapason*, or *Principal.* Organ tone.
The foundation stop of the organ, which gives it its peculiar dignity. Cylindrical pipes of heavy metal of 40 per cent. tin and upwards, furnishing the ground work of the loud combina-

tions. The basses are mounted in the front of the case, generally the lower seventeen pipes. The voicing of this stop should be neither like a string-tone nor flute-tone, but with a full sonorous organ-tone quality. When the Great Organ contains two Open Diapasons, one is of robust timbre, and the other of a more mellow character.

8 ft. *Bell Diapason.* Organ tone.
An Open Diapason stop, with sliding bells for tuning. The bell tends to increase the strength of tone. As these pipes can not be set closely together on the ordinary sized wind-chest, it is rarely used.

8 ft. *Horn Diapason.* Organ tone.
Inverted conical pipes, voiced with a powerful horn-like quality of tone.

8 ft. *Flute a Pavillon.* Organ tone.
Cylindrical pipes, surmounted with bell tops. The French name for the Bell Diapason.

8 ft. *Gemshorn.* Flute tone.
Metal pipes of conical form, the top one-third of the diameter of the mouth. The tone is of a light sympathetic quality.

8 ft. *Dulciana*, or *Dolce.* Organ tone.
Open metal cylindrical pipes, voiced with a gentle quality of tone. A very useful stop in all soft accompaniments.

8 ft. *Æoline.* String tone.
Small scale open metal cylindrical pipes. The softest stop in the organ, placed in the Swell and very effective in pianissimo passages, echo effects, etc., the tones being scarcely perceptible when the Swell is closed. In some churches this stop is played during the reading of the Psalms, and through the Communion and Marriage services.

8 ft. *Dolcan.* Flute tone.
Open metal pipes in the form of an inverted cone, producing a pleasing quality.

8 ft. *Gamba.* String tone.
Slim scale open metal cylindrical pipes, of an incisive string-like quality. When a strong quality is desired, the lower lip is provided with a *beard* (Fig. 16), to give steadiness to the tone, which without it is apt to roll. It is somewhat slow in speech when used alone.

8 ft. *Salicional.* String tone.
Pipes like the Gamba, but somewhat softer in voicing, generally placed in the Swell.

8 ft. *Bell Gamba.* String tone.
Conical pipes surmounted with a bell, provided with flexible ears for tuning. The tone is of thicker quality than the cylindrical Gamba.

8 ft. *Viol d'Amour.* String tone.
Pipes like the Bell Gamba, of softer voicing.

8 ft. *Keraulaphon.* String tone.
Pipes like the Salicional, with a round hole near the top.

8 ft. *Geigen Principal.* String tone.
Metal pipes of smaller scale than the Open Diapason, voiced with a violin-like quality, and generally placed in the Choir organ.

8 ft. *Rohr Gedeckt.* Flute tone.
Metal cylindrical pipes, half stopped and provided with a tube or chimney, hence the name "Rohr."

8 ft. *Stopped Diapason.* Flute tone.
Stopped wood pipes, rarely of metal. The tone is of a mild fluty character.

8 ft. *Gedeckt.* Flute tone.
Stopped wood pipes of smaller scale than the St. Diapason, with mouths cut high, giving a clear bell-like tone.

8 ft. *Doppel Flote.* Flute tone.
Stopped wood pipes of large scale, the depth of the pipes being twice the width, with mouths on the front and back. It is the strongest toned of the covered stops, and adds much to the fullness of the organ, its filling qualities being next to the 8 ft. Open Diapason.

8 ft. *Quintadena.* Flute tone.
Stopped metal pipes with the mouth low, and voiced to sound the fifth with the ground tone. The same effect is produced in combination with the 8 ft. Salicional an d2⅔ ft. Gemshorn Quint.

8 ft. *Melodia.* Flute tone.
Open wood pipes with inverted mouths. The tone is clear and horn-like. The bass is generally of stopped wood pipes.

8 ft. *Clarabella.* Flute tone.
Open wood pipes with regular mouths. The tones resemble the Melodia, but more subdued.

8 ft. *Portunal.* Flute tone.
Wood pipes of inverted pyramidal form, of clarinet-like quality.

8 ft. *Hohl-Flute.* Flute tone
Metal cylindrical pipes of large scale, producing a powerful tone of a *hollow* quality. When made of wood the pipes are triangular, producing a milder tone.

8 ft. *Philomela.* Flute tone.
Small scale stopped wood pipes, voiced with the sweetest and most delicate quality.

8 ft. *Voix Celestes*, or *Unda Maris.* Organ tone.
Metal pipes formed of two Dulcianas to a note, the pipes of one set turned a few waves sharper than the other, producing a waving, undulating effect.

8 ft. *Bifra.* Flute tone.
A stop composed of two ranks of pipes of 8 ft. and 4 ft. tone, giving a pleasing quality. A tremolo is also combined with it.

8 ft. *Trumpet.* Reed tone.
Reed pipes of powerful tone, used in the Full Organ, and as a solo stop when combined with the 8 ft Open Diapason, accompanied with the full swell.

8 ft. *Tuba Mirabalis.* Reed tone.
Trumpet pipes of a large scale, voiced with heavier wind-pressure on a separate chest, often projecting horizontally from the top of the case, and then finished with bells resembling brass instruments.

8 ft. *Cornopaean*, or *Horn.* Reed tone.
Powerful reed pipes of the Trumpet quality, placed in the Swell.

8 ft. *Oboe and Bassoon*, or *Hautboy.* Reed tone.
Reed pipes of small scale, surmounted with a bell, producing a delicate wailing tone, imitative of the instrument for which it is named. Placed in the Swell.

8 ft. *Clarinet.* Reed tone.
Reed cylindrical pipes, surmounted with sliding bells, of a clear imitative tone. Placed in the Choir organ.

8 ft. *Vox Humana.* Reed tone.
Short cylindrical reed pipes partially covered at the top. With certain combinations, used with the Tremolo, it is imitative of a choir of voices when played in contrast to the full Great Organ. As a solo stop, it is only imitative in the Tenor, and then it must be nearly covered with flute stops.

8 ft. *Cor Anglais.* Reed tone.
Reed pipes with a chamber of the shape of two cones, one inverted, placed base to base in the body of the pipes, as in Fig. 34.

8 ft. *Vox Angelica.* Reed tone.
Free reed pipes of the most delicate voicing.

8 ft. *Musette.* Reed tone.
Soft voiced reed pipes with conical bodies.

8 ft. *Physharmonica.* Reed tone.
A set of free reeds similar to those of the Harmonium, enclosed in a box which opens with a separate pedal, and thus gives the expression. The reeds are placed in a flat horizontal position and are provided with tuning-wires.

4 ft. *Octave*, or *Principal.* Organ tone.
Cylindrical metal pipes. The stop to which the organ is tuned.

4 ft. *Violin.* String tone.
Cylindrical metal pipes of small scale giving an imitative quality.

4 ft. *Celestina.* Organ tone.
An octave Dulciana.

4 ft. *Flute Harmonique.* Flute tone.
Cylindrical pipes of metal of twice their speaking length. The bodies are perforated with a small hole midway between the mouth and the top (Fig. 15). The pipes are copiously winded and overblown so as to speak an octave higher, the tone being very full and flute-like. The basses are not of double length.

4 ft. *Traverse Flute.* Flute tone.
Wood flute harmonic pipes, sometimes made with cylindrical bodies of maple turned and polished, with a round mouth, as in the common flute.

4 ft. *Flute Octaviante.* Flute Tone.
Metal cylindrical pipes voiced with clear and flute-like quality.

4 ft. *Night Horn.* Flute tone.
Large scale cylindrical metal pipes, producing a full flute tone of horn-like quality.

4 ft. *Flute d' Amour.* Flute tone.
Conical pipes giving a delicate and lovely tone.

4 ft. *Wald Flute.* Flute tone.
Wood pipes with inverted mouths, like the Melodia.

4 ft. *Concert Flute.* Flute tone.
Wood pipes of large scale copiously winded, with inverted mouths, the upper lip being sometimes made diagonal, as in Fig. 24.

4 ft. *Flute a Chiminee.* Flute tone.
Half stopped metal pipes with tubes or chimneys at the top. Sometimes of wood.

4 ft. *Fugara.* String tone.
Metal cylindrical pipes of string-like quality, stronger than the Violin.

4 ft. *Clarion.* Reed tone
Octave Trumpet pipes.

$5\frac{1}{3}$ ft. *Quint*, or *Quint Flote*, or *Dominant.* Flute tone.
Pipes either of metal open, or stopped wood, voiced with a flute-like blending quality, and tuned a fifth above the 8 ft. pitch. A mutation stop. When properly voiced it forms many pleasing combinations with other stops, such as the Gamba, Tebia Major, etc. The organ should contain a 16 ft. manual stop when this stop is included.

$2\frac{2}{3}$ ft. *Twelfth*, *Octave Quint*, or *Nasard.* Flute tone.
Cylindrical pipes, voiced with flute-like quality, and tuned twelve diatonic tones above the 8 ft. Open Diapason. A mutation stop.

$2\frac{2}{3}$ ft. *Gemshorn Quint.* Flute tone.
Conical pipes of the same pitch as the Twelfth, but with more delicate voicing. A very beautiful Swell combination stop.

2 ft. *Fifteenth*, *Super-Octave*, or *Doublette.* Organ tone.
An open cylindrical metal stop, two octaves above the 8 ft. pitch.

2 ft. *Piccolo.* Flute tone.
An open metal stop of strong flute-like quality, clear and penetrating, of the same pitch as the Fifteenth. Placed in the Choir organ.

2 ft. *Flageolet*, or *Flautino.* Flute tone.
A metal conical stop of pleasing quality, placed in the Swell.

2 ft. *Harmonic Piccolo.* Flute tone.
Metal pipes made like the Flute Harmonique.

Mixtures. Organ and Flute tone,
The general name for compound stops of from two to five ranks comprised under the name of *Mixture*, *Acuta*, *Furniture*, *Ses-*

quialtera, *Cornet*, *Harmonics*, *Sharf*, etc. The pipes are of open metal, and the octaves break back again according to the proper balancing which the full organ requires. The octave tones are of the organ quality, and the mutation pitches are voiced with the flute tone. In large organs the $5\frac{1}{3}$ rank is made of stopped wood.

$3\frac{1}{5}$ ft. *Terza.* Flute tone.
Open cylindrical pipes tuned ten diatonic notes above the 8 ft. Open Diapason, of a subdued flute-like character. Rarely used, excepting in the largest organs.

$1\frac{1}{2}$ ft. *Tierce.* Flute tone.
Metal cylindrical pipes of subdued flute-like tone, tuned seventeen diatonic notes above the 8 ft. Open Diapason. Rarely used excepting as a rank in the *Sesquialtera*.

PEDAL STOPS.

32 ft. *Double Open Diapason*, or *Untersatz*. Organ tone.
Either of wood or metal. When of wood the stock is two inches thick, and the lowest pipe is 24 inches deep and 20 inches wide, inside measurement. When of metal, the pipes are of burnished block-tin, and are placed in the front of the case, the lowest pipe in the largest organs measuring 2 ft. 6 inches in diameter. The tone is not powerful in the lowest octave, but the lowest pipe gives the effect of a heavy vibration of the air, it being more effective when used with the 16 ft. Pedal Open Diapason. The depth of a 32 ft. tone may be resultantly illustrated on an organ possessing a good 16 ft. Open Diapason in the pedals by sounding the lowest $\underline{C}_0$ and G. the fifth above, and a deep tone-wave will be heard equivalent to the depth of a 32 ft. tone.

32 ft. *Double Bourdon*, or *Sub-Bourdon*. Flute tone.
These are sixteen feet stopped pipes of wood, quite effective in producing the 32 ft. tone. The inside measurement of the lowest pipe is 15 inches deep by 12 inches wide.

32 ft. *Bombarde*. Reed tone.
This is a massive reed stop with bodies either of wood or metal, placed only in organs of the largest dimensions.

16 ft. *Open Diapason*, or *Principal*. Organ tone.
This is the foundation stop of the Pedal Organ, which gives to the instrument its majestic solemnity, and with the lower pipes produces the deep thunder-tone rumble which causes the windows

to shake and the floor to apparently tremble. The focal points of the lower tones are easily discovered in the audience room; that is, points where the tones sound with the best effect, when upon moving a few feet away, out of the range of vibrations, the same tone will hardly be perceptible and *vice versa*, no one point in the room giving the different tones with the same effect. The tone is the most effective when the pipes are made of wood. Experience has proved that the inside dimensions of 14 inches in depth and 12 inches in width, when rightly voiced, give as full tone to the ear as when of larger size. The corresponding stop in large German organs seldom measures more than 12 inches in depth. When made of metal the tone is not so resonant in the lower octave. It then forms a portion of the display pipes in front.

16 ft. *Bourdon* or *Sub-Bass.* Flute tone.
This is an 8 ft. stopped set of pipes of wood, giving a smooth pervading tone, and a very valuable stop, as it serves for a sub-bass to the soft manual combinations. In small organs it serves entirely for the sub-bass, being voiced with strength enough to be effective in the full organ. The lowest pipes measure inside $8\frac{1}{2}$ inches deep and 5 inches wide.

16 ft. *Dulciana* or *Dolcian.* Organ tone.
This stop is either of wood or metal, more effective when made of wood. It is an open set of pipes of small scale, giving a deep, smooth and mellow tone. The inside measurement of the lowest pipe is 9 inches deep and 7 inches wide.

16 ft. *Violone* or *Contra Bass.* String tone.
A small scale open wood stop, voiced with a string-like quality of tone, the pipes having beards. It is somewhat slow in speech, which gives the effect of the bow on the strings of the Double Bass Viol.

16 ft. *Gamba.* String tone.
A metal stop of string-like quality, conical, surmounted with a bell top.

16 ft. *Trombone* or *Posaune.* Reed tone.
A powerful reed stop, with bodies of metal or wood.

16 ft. *Bassoon.* Reed tone.
A slim scale reed stop of delicate voicing.

$10\frac{2}{3}$ ft. *Quint* or *Quintolophon.* Flute tone.
Stopped wood pipes of a soft quality, tuned a fifth higher than

the 16 ft. open Diapason. When sounding with the 16 ft. stops, it produces a resultant tone imitative of a 32 ft. Double Bourdon.

8 ft. *Violoncello.* String tone.
Pipes of metal, voiced in imitation of the instrument so called. It is sometimes made of wood.

8 ft. *Principal* or *Octave.* Organ tone.
Wood pipes, the octave above the 16 ft Open Diapason; also of metal.

8 ft. *Flote.* Flute tone.
An open wood stop, with inverted mouths of the quality of the manual Melodia.

8 ft. *Dolcissimo.* Organ tone.
A soft metal stop corresponding in quality to the manual Dulciana.

8 ft. *Tromba*, or *Trompette.* Reed tone.

4 ft. *Super Octave.* Organ tone.
A loud metal stop two octaves above the 16 ft. Open Diapason.

4 ft. *Flauto.* Flute tone.
Wood pipes with clear flute-like tones.

2 ft. *Clarina.* Organ tone.
A loud-toned metal stop of large scale, which gives clearness to the pedal organ when no pedal couplers are drawn.

Mixtures. Organ and Flute tone.
These are the harmonics of the foundation pedal stops, and have from two to five ranks each.

GROUPING OF THE VARIOUS ORGAN STOPS,

ACCORDING TO TONE QUALITY.

MANUAL STOPS.

ORGAN TONE.

16 ft. Gross Principal.
16 ft. Montre.
16 ft. Contra Principal.
16 ft. Unter Chormaas.
16 ft. Double Open Diapason.
16 ft. Prestant.
16 ft. Double Dulciana.
8 ft. Open Diapason.
8 ft. Montre.
8 ft. Bell Diapason.
8 ft. Principal.
8 ft. Dulciana.
8 ft. Dolce.
8 ft. Dolcissimo.
4 ft. Octave.
4 ft. Principal.
4 ft. Prestant.
4 ft. Celestina.
4 ft. Dolcette.
2 ft. Fifteenth.
2 ft. Super Octave.
2 ft. Doublette.

STRING TONE.

16 ft. Gamba Major.
16 ft. Contra Gamba.
16 ft. Salicional Contra.
8 ft. Geigen Principal.
8 ft. Gamba.
8 ft. Viola da Gamba.
8 ft. Viola Diapason.
8 ft. Viol d'Amour.
8 ft. Kalophon.
8 ft. Sicilienne.
8 ft. Keraulophon.
8 ft. Viola.
8 ft. Salicional.
8 ft. Solcional.
8 ft. Bell Gamba.
8 ft. Bearded Gamba.
8 ft. German Gamba.
4 ft. Fugara.
4 ft. Violin.
4 ft. Gambette.

FLUTE TONE.

32 ft. Sub Bourdon.
32 ft. Manual Untersatz.
4 ft. Traverse Flute.
4 ft. Wald Flute.

16 ft. Gross Gedeckt.
16 ft. Major Gedeckt.
16 ft. Bourdon.
16 ft. Lieblich Bourdon.
16 ft. Tibia Major.
16 ft. Rohr Flote.
16 ft. Lieblich Gedeckt.
16 ft. Still Gedeckt.
16 ft. Quintaton.
8 ft. Doppel Flote.
8 ft. Hohl Flote.
8 ft. Melodia.
8 ft. Clarabella.
8 ft. Gedeckt.
8 ft. Stopped Diapason.
8 ft. Gemshorn.
8 ft. Rohr Flote.
8 ft. Flauto Amabile.
8 ft. Harmonica.
8 ft. Philomela.
8 ft. Mandoline.
5⅓ ft. Quint.
5⅓ ft. Quint Flote.
5⅓ ft. Gross Nasard.
5⅓ ft. Dominant.
5⅓ ft. Diapente.
5⅓ ft. Gemshorn Quint.
5⅓ ft. Rohr Quint.
4 ft. Concert Flute.
4 ft. Flute Octaviante.
4 ft. Flute Harmonique.
4 ft. Night Horn.
4 ft. Spitz Flote.
4 ft. Hohl Flote.
4 ft. Hohl Pfeife.
4 ft. Flute Dolce.
4 ft. Rohr Flote.
4 ft. Flute a Chiminee.
4 ft. Flute d'Amour.
4 ft. Flute a Pyramide.
4 ft. Block Flute.
4 ft. Gedeckt Flute.
4 ft. Bauer Flote.
4 ft. Choral Flote.
4 ft. Divinare.
4 ft. Dolz Flote.
4 ft. Tibia Suavis.
4 ft. Flauto Militaris.
4 ft. Feld Flote.
4 ft. Tibia Silvestris.
3⅕ ft. Gross Tierce.
3⅕ ft. Tertian.
2⅔ ft. Twelfth.
2⅔ ft. Octave Quint.
2⅔ ft. Nasard.
2⅔ ft. Gemshorn Quint.
2 ft. Piccolo.
2 ft. Flageolet.
2 ft. Flautino.
2 ft. Harmonic Piccolo.
2 ft. Wald Flute.
2 ft. Fiffaro.
2 ft. Fife.
1⅗ ft. Tierce.
1⅗ ft. Terza.
1⅓ ft. Larigot.

REED TONE.

16 ft. Double Trumpet.
16 ft. Bombarde.
16 ft. Bombardon.
16 ft. Tromba.
16 ft. Euphone.
16 ft. Contra Fagotta.
8 ft. Vox Humana.
8 ft. Regal.
8 ft. Clarinet.
8 ft. Krumhorn.
8 ft. Cremona.
8 ft. Crumhorn.

8 ft. Trumpet.
8 ft. Cornopœan.
8 ft. Horn.
8 ft. Corno Anglaise.
8 ft. Oboe.
8 ft. Hautboy.
8 ft. Bassoon.
8 ft. Vox Angelica.
8 ft. Schalmay.
8 ft. Musette.
8 ft. Physharmonica.
8 ft. Terpodion.
8 ft. Opheiclide.
8 ft. Tuba Mirabalis.
8 ft. Trombaphon.
4 ft. Clarion.

COMPOUND STOPS.

Mixture.
Clear Mixture.
Harmonic Mixture.
Sesquialtera.
Cornet.
Echo Cornet.
Harmonia Ætheria.
Acuta.
Scharf.
Cymbel.
Furniture.

PERCUSSION STOPS.

Campanella (Steel Bars).
Glocken Spiel "
Carillons (Bells).
Tympani (Drum).
Tambour (Drum).
Pauken "
Trommel "

PEDAL STOPS.

ORGAN TONE.

32 ft. Double Open Diapason.
32 ft. Gross Principal.
32 ft. Untersatz.
32 ft. Flute Ouverte.
16 ft. Open Diapason.
16 ft. Principal.
16 ft. Prestant.
16 ft. Dulciana.
16 ft. Dolcian.
16 ft. Flute Ouverte.
8 ft. Octave.
8 ft. Principal.
8 ft. Docissimo.
4 ft. Super Octave.
4 ft. Principal.
2 ft. Clarina.

STRING TONE.

16 ft. Violone.
16 ft. Contra Bass.
16 ft. Gamba.
16 ft. Salicet.
8 ft Violoncello.
8 ft. Gamba.
8 ft. Salicet.
8 ft. Viola.

FLUTE TONE.

32 ft. Sub-Bourdon.
32 ft. Quintaton.
32 ft. Grand Bourdon.
16 ft. Bourdon.
16 ft. Sub Bass.
16 ft. Double St. Diapason.
16 ft. Quintaton.
10⅔ ft. Quint.
10⅔ ft. Quintolophon.
10⅔ ft. Quint Flote.
10⅔ ft. Gross Quint.
8 ft. St. Diapason.
8 ft. Unison Bass.
8 ft. Flote.
8 ft. Pedal Flote.
6⅖ ft. Terza.
6⅖ ft. Tertian.
5⅓ ft. Octave Quint.
4 ft. Flauto.
4 ft. Pedal Flote.
3⅕ ft. Tierce.
2⅔ ft. Larigot.

REED TONE.

32 ft. Bombarde.
16 ft. Trombone.
16 ft. Posaune.
16 ft. Bombarde.
16 ft. Bassoon.
16 ft. Basset.
8 ft. Trumpet.
8 ft. Tromba.
8 ft. Trombone.
8 ft. Octave Bassoon.
8 ft. Ophycleide.
4 ft. Octave Clarion.

The foregoing vocabulary, as applied to organ stops, does not indicate distinct tone qualities, but combines the names used in Europe and the United States, one tone quality or timbre thus having several names.

MECHANICAL.

Coupler Great Manuale to Pedale.
Coupler Swell Manuale to Pedale.
Coupler Choir Manuale to Pedale.
Coupler Solo Manuale to Pedale.
Coupler Swell Manuale to Great Unison.
Coupler Swell Manuale to Great Octave above.
Coupler Swell Manuale to Great Sub-Octave.
Coupler Choir Manuale to Great Unison.
Great Manuale Octave Coupler.
Pedale Octave Coupler.
Pedale Octave Diapason.
Pedale Quint Coupler.
Swell Tremolo.
Choir Tremolo.
Pedale Separation.
Great Separation.
Swell Separation.
Bellows Signal.
Pedal Check.
Bellows Check.

Coupler Choir Manuale to Great Sub-Octave.
Coupler Solo Manuale to Great Unison.
Coupler Swell Manuale to Choir Unison.
Hydraulic Engine.
Ventil.
Evacuant.
Calcant.
Campanula (Bell Signal).

PEDAL MECHANISM.

Great Forte Composition Pedal.
Great Mezzo Composition Pedal.
Great Piano Composition Pedal.
Swell Forte Composition Pedal.
Swell Piano Composition Pedal.
Pedal Forte Composition Pedal.
Pedal Mezzo Composition Pedal.
Pedal Piano Composition Pedal.
Balanced Cresendo, or Swell Pedal.
Reversible Pedal coupling Grea to Pedale.
Reversible Pedal coupling Swell to Great.
Cresendo Pedale for bringing on the Stops from the softest to Full Organ, and *vice versa*.
Adjustable Swell Pedal.

TUNING AND CARE OF THE ORGAN

When the organ is in readiness to receive the pipes, all the Flue pipes are placed in their final position, with the mouths so turned that they all have freedom of speech. The 4 ft. Octave or Principal has an *equal temperament* set in the *three middle octaves*, and to this stop all the others are tuned. The softer stops, like the Dulciana and Gamba, if tuned to a strong toned stop, will *draw* into tune, and be found out of tune with themselves when used alone, requiring them to be tuned in several octaves to the Twelfth or Quint, fifths being less liable to *draw* than unisons or octaves.

The organ-tuner listens to waves or beats, rather than the pitch of the different tones. He has a set of tuning implements called *cones* for the pipes which have not the tuning slits, the coned pipes having previously been cut in tune on the voicer. The pipes with tuning slits have the metal rolled with a small pair of pliers, with great care, so as not to go *by* the tuning point, as in rolling the metal back the pipes lose their voicing.

The stopped wood pipes are sharped with a small hammer, care being taken that the tampions fit well so as not to split the pipes, or too loose, in which latter case they would not give the right quality of tone nor remain in tune.

The reed pipes are inserted last, as dirt is liable to be dropped in and stop the reeds from vibrating, a disadvantage they are always subject to, causing care in removing small obstructions as long as they are in use. The tuning is effected by the tuning-wire, as before explained. Generally, when a reed pipe is speechless, if it is flatted its full extent and the key struck quickly several times, the substance will be released and the pipe may be brought in tune. If this is not successful, the reed must be carefully cleaned by removing the spring, care being taken not to bend the reed, and a piece of smooth letter paper passed between the reed and the eschallott, pressing the reed as the paper is moved. It is better to see an expert do this the first time before attempting it.

Among the flue pipes, the sensitive Gambas are the most easily put out of voice by very small particles lodging in the flue, causing them to sound the octave or fifth, and when the pipes of the bass of these stops have just been made, the metal being new, after the languages have been adjusted they sometimes spring back again, so that the pipes speak their fifth. A readjustment after they have stood some length of time will be permanent. Whenever a pipe ceases to give its tone, there is always a cause, which may be traced out and remedied. In a new organ, small bits of sawdust or shavings cling to the wind-trunks and chests; fragments often blow into the flue of a pipe or lodge upon the surface of a valve, causing the tone to sound until removed.

There should be a gas-burner in the swell-box and over the Great Chest, at some distance above the pipes, and also near the action-work, to give light in keeping the organ in order, and to avoid the necessity of taking a candle inside, the tallow of which is liable to drip into the pipes and choke their speech.

It is a well known axiom that "every art is a compromise with nature, whether in governing man or materials." However experienced the skill, or well seasoned the materials of an organ, the highest result betrays imperfections which are concomitant with the perishable substances, beyond the power of man to control. Thus, the portions of wood-work of the best quality throughout, highly seasoned as they should be, and adjusted with every possible allowance for changes of temperature, being placed in a church which is closed during the week, in a wet season, dampness gathers for a lack of circulation of the air, which will be absorbed by the dry wood-work of the organ, and some part will unavoidably bind for the time being, trackers twist in their guides, top-boards cast so as to make

the slides go hard, necessitating their being dressed off again, and many other similar derangements; then a sudden furnace or steam heat being applied in the room causes an extreme condition of the substances which enter the construction.

The heavy weight of the organ will settle a little, so as to derange the action-work and cause the keys to stick, or a button will slip on the threaded wire, and as a consequence the key will not open its valve. These are inevitable results, sooner or later, in the best workmanship and need attention the same as will all kinds of machinery. Wood-work will shrink and swell with the different conditions of the atmosphere, even when protected with all needful care.

A simple change of position of some part, or lack of lubrication, will cause a squeaking or cracking of the bellows, which, however small, is more apparent in its effects than the sweetest music being produced.

Every disarrangement of the mechanism should be at once traced out and speedily adjusted. A well constructed organ, after having withstood the changes of heat and cold, artificial and natural, dampness and dryness, and hard playing also through the year, and then thoroughly regulated and tuned, is then in its best condition, as it has then proved itself, and for many years with careful usage will serve its purpose and preserve its powers.

Every organist should know the general structure of the organ, that he may have full control of the management of its mechanism and be able to adjust any trivial derangement of the action-work, which is liable to occur in so complicated an instrument, and though a button may need a simple turning for adjustment, the neglect of it will be detrimental to the proper execution of the music.

When a disarrangement appears intricate and unaccountable, communication should at once be had with the builder for explanation, that it may be properly rectified. Every well organized church organ manufactory has a special department devoted to repairing organs, and sends out reliable men to tune and put them in order, and frequently take care of them by the year by contract. An organ should be thoroughly cleaned every three or four years, to remove the dust which settles in the pipes and tends to throw them out of voice; also to free them from insects and pieces of plastering which drop from the ceiling. Rats and mice cause much damage in an organ, gnawing holes through the leathered work of the bellows and the soft wood works, in order to eat the glue.

Where the pipes are thoroughly made of substantial metal and well seasoned wood, the flue-pipes, in themselves, will not change so as to affect the tuning for a long time.

The concord of the pipes with each other depends much upon the condition of the air as indicated by the thermometer and barometer, whether warm or cold, rarefied or dense. If an organ is tuned with the air at 60 degrees, and then the temperature is raised to 70 degrees, the vibrations will be quicker and the pitch of the flue-pipes higher, on account of the rarefied state of the air. It is not the expansion or contraction of the metal or wood which causes the pipes to be out of tune with each other, but the dense or rarefied condition of the air in and surrounding the pipes, a difference of from five to ten degrees either way from the temperature at which the organ has been tuned, producing a very perceptible variation in the tuning.

As heated air causes the flue-pipes to be sharper in pitch, with the reed pipes it is the opposite, the heat affecting the brass tongues causes the vibrations to be slower, therefore flatter, and the consequent disagreement of the flue and reed pipes, and there is no remedy to this philosophical condition of the law of musical vibrations. A reed stop to be in good tune, should be tuned just before it is used in a public performance, and every organist can easily acquire the practical knowledge of keeping the reeds in tune.

In winter an organ is seldom in tune during the morning service, or in the same condition as at the evening service. In the morning the air is not fully heated within the organ, and when the different wind-chests are not in the same strata of temperature, they will be out of tune with each other. Especially will it be so if the swell-box has been accidentally left closed, so that the air within has not become heated. An experienced organist recognizes this condition of the atmosphere in its effect on the organ pipes, and avoids drawing the reed stops until the temperature is equalized. The presence of a large audience also, by changing the condition of the air, affects the tuning of the organ for the time, which is perceptible toward the end of a service.

THE MUSICAL CAPACITY OF THE ORGAN.

Legitimate Organ Music requires an instrument possessing at least Two Manuals and twenty-seven Pedal Keys from $C_{\underline{o}}$ to D° to

interpret it, as in the passages intended for a solo stop, contrasted with a different quality of tone played upon another manual with the other hand, which if attempted to be executed upon one manual, the notes represented for each hand would conflict, and could not be understood. To render it with facility of combinations a Three-Manual Organ is required. In a few instances the pedal part extends thirty notes, to F, as in the celebrated Toccata in F by J. S. Bach, and an organist who studies this high class of music would not be satisfied with a less compass of the pedals. The Organ Sonatas and Fugues of Mendelssohn do not employ over twenty seven notes, and they may safely be taken as a standard compass. The largest organs thus far constructed, like the one in Royal Albert Hall, London, have a compass of thirty-two notes, to G.

The musical capacity or size of the organ is measured by the number of ranks of pipes, or slides of the chests, and not by the number of the draw-stop knobs, which latter include the mechanical accessories and divided stops. A divided stop, like the Oboe and Bassoon, generally indicated in specifications as $\left\{\begin{smallmatrix}8\text{ ft. Oboe}\\8\text{ ft. Bassoon}\end{smallmatrix}\right.\ \begin{smallmatrix}49\\12\end{smallmatrix}\left.\right\}61$, is counted as one stop or register in reckoning the musical size of the organ.

When an organ is designed simply for choral accompaniment, without any attempt at organ music as a part of the service, a single-manual organ will answer the purpose of sustaining the voices, but it does not contain the capacity to draw forth any inspiration from the organist.

Musical culture in the United States is rapidly advancing, and when an organ is to be built for a church, with future years in view, this should be borne in mind, and the capacity of the new instrument made as large as the means of the society will permit. The increased variety of the stops gives greater power of musical expression, and causes it to be more helpful in attaining its sphere of usefulness as an aid in public devotion and refinement of taste. The greater the variety of the stops, the richer will be the combinations and more mellow the full power of the instrument, rendering it a means of stimulating musical progress among all who are impressed with the influence of its tones.

ORGAN MUSIC.

The foundation of the success of the Church Organist lies in his power of adapting his music to the sphere of the congregation, so as to enlist the sympathetic feelings of the listeners; not in lowering

the standard of true organ music, not by calling attention to his individuality by startling effects, out of place in the service, but by seriously considering the object of the music for the time and place whether the occasion is one of penitence or rejoicing, of mourning or thanksgiving. The object of organ music is to assist in leading us upward to thoughts of the Spiritual Life, to Him who alone inspires our purposes with noble motives. The Organ, above all other musical instruments, conveys to our minds, by its sustained tones and connected chords, impressions deeply allied with our devotional natures, and with this idea ever in mind, should it be used in whatever religious denomination it assists in the service. Thus will its true object of use be accomplished, and the organist attain a position which will carry out the high principles of his art, by using his cultivated musical talents to aid in elevating the thoughts of his fellow beings toward the end for which all were created. For this purpose is the grand instrument placed in the Temple of Worship, and with this spirit should its keys be reverently touched when leading the devotions of the people.

The *Prelude*, at the opening of religious ceremonies, should be considered as a part of the service preparatory for worship, and not as a musical exercise to fill up the time and to cover the noise of the entering of the congregation. If the organist is gifted with a faculty for improvisation which is disciplined by rules of harmony, he can adapt the voluntary to this desired end. Without this faculty, selections should be appropriately made with this object in view.

For the *Postlude*, at the close of service, many players have been accustomed to begin at once with the full organ. This is often objectionable as not being in sympathy with the peaceful benediction. The most effective and useful method is to begin the postlude with the soft stops, so that the influences of the devotional exercises shall not be disturbed by the immediate clang of loud, crashing chords, which are frequently repulsive to sensitive minds at that time, and particularly so to clergymen. Beginning with gentle stops, a crescendo may be gradually worked up to the full power of the instrument, leading to the subject of the classical fugue, with its dignified themes swelling in majestic harmony as each part enters the polyphonic structure, impressing the minds of worshipers with emotions of the sublimity of organ music as they wend their way from the sanctuary.

This country is yet quite new in its musical advantages, excepting the largest and older cities, which are musical centers and possess

large organs and organists of great talent and ability. Remote from these favored localities the people have not been made familiar with organ music as such, through many years listening to its intricate harmonies and dignified themes, and consequently do not readily appreciate it. Neither do smaller places afford an organ salary adequate to remunerate one for devoting so much time as is needful to acquire the technique to execute organ music of the highest class, but in due time it will gradually establish its power at the key-desk and have its devout listeners, and the ideal of the organist will be to rightly interpret the best thoughts of those whose lives were devoted to their noble art.

Classical organ music occupies its own field, as do the classics in the literary world. Both must be acquired by those who are enthusiastic students, and it is not expected that music of this grade can be appreciated at a first hearing, even by adepts. The difference between so-called "classic" music and that which is not so-called, is this: The former exhibits an artistic culture in its structure which the latter does not. The word classic, as applied to music, indicates an elegance of composition possessed only by those who are gifted with the highest order of natural musical ability, refined by the most thorough education in all the intricacies of the art, whose few names are written on the pages of history as the Great Masters. Ordinary music contains simply a melody, represented by the upper part, or air, with accompaniment of chords in plain harmony. The structure of classical organ music gives to each part, or "voice," its distinct melody, as well as to the upper part, flowing on symmetrically together, but requiring studious attention to appreciate. The apparent confusion to a listener unfamiliar with this style of music results from the upper part being no more the melody itself than are the interior parts, and this effect can not be otherwise until such music is oftener heard and more widely cultivated.

The strict school of organ music is classed under this head, and is represented by the Fugue and pieces in Imitation. The German School of Organ Music, at the head of whom stands the giant name of John Sebastian Bach, consists quite entirely of this order of composition. In this school the Pedal part is as melodious and independent as the parts for the fingers, and requires the use of both feet. The music is of an intellectual nature rather than emotional, there being no expression given in the way of crescendo and diminuendo, or calling for the use of the Swell Organ as such, both feet being

occupied with the execution of the Pedal part. The swell compartment is a recent introduction in German organs.

Organ music is written with three staves, the lower being for the Pedal part.

The Free Style is not bound by strict contrapuntal rules, but abounds with graceful melodies and varied accompaniments, and numerous changes of registration in orchestral imitation.

The English School includes both the strict and the free style in concert playing, but in the service of the church it is serious and in the ecclesiastical style.

The French School is quite entirely in the free style, as illustrated in the compositions of Lefebure Wely and Batiste.

It is light and pleasing, and sometimes trifling and sensational. The Pedal organ is employed more in giving the fundamental basses or their inversions to support the accompaniments than in melodic passages, played generally by the left foot alone in the soft passages, while the right foot rests upon the swell pedal, employed in giving expression, excepting in full organ phrases. This style is more attractive to the masses of the public, and is most frequently heard in the ceremonials of the Roman Catholic Church, which are nearly all associated with appropriate music. The thorough organist excludes that class of music which is frivolous in this elaborate service.

Overtures and orchestral transcriptions upon a modern instrument, with ample resources, may be successfully adapted and rendered. They are not ecclesiastical, but serve to give variety to an organ recital, and are a means of education to listeners who can not often hear works of grand orchestral music.

As a fluent rendering of the pedal part renders organ music very difficult of execution to the novice, the more thorough the student has been in manual practice on piano forte technicalities of finger discipline in scales, arpeggios, etc., the better the mind can be concentrated upon the pedal part in organ practice. The German school is unquestionably the best for self-control and education, as it has the highest form of construction, and will elevate the ideas of musical form, but it can not be forced upon the public at large.

One of the best methods of quietly inculcating and extending the love for true organ music, is by giving a programme half an hour before service each Sunday, beginning with classical music, selecting from the best composers and making careful preparation for it during the week preceding. If this course is persistently pursued, not only

will it stimulate the organist in his own improvement, but it will give satisfaction to those who revere classical organ music, who will be present early to hear it, without its being obtruded on those who have no taste for it.

Every organist should be well grounded in the science of harmony and musical composition, which should go hand in hand with his manual and pedal studies. For theoretical information, Burrows' Thorough Bass Primer is a good hand-book to begin with; then Albrechtsberger's Thorough Bass, Counterpoint and Fugue, and Cherubini's Counterpoint and Fugue; also Marx's Musical Composition, are good works to be found in English. He should always have at command the accompaniments to the standard Oratorios, such as the Messiah, Creation, etc., which are studied each winter by musical societies; and also the accompaniments to the masses of Haydn, Mozart and the other standard composers in this field.

Among useful instruction books for the Pipe Organ are the following works:

Organ School, by A. G. Ritter, (German).
Organ School, by C. H. Rinck, (German.)
School of Velocity, by W. Volkmar, (German).
Art of Organ Playing, by W. T. Best, (English).
Art of Organ Playing, by W. E. Thayer, (American).
Organ School, by J. Zundel, (American).
Organ School, by J. Lemmens, (French).
Studies for the Pedal Organ, by W. H. Clarke.

Among collections of Organ Music, the following are much in use:

Complete Organ Works of J. S. Bach (Peter's Edition), 10 vol.
Six Organ Sonatas, Mendelssohn.
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Organist's Journal, Frederic Archer.

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Der Angehende Organiste, G. W. Korner.
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Journal Classique de l'Organiste, Mougin. 10 books.
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Fifty Voluntaries, E. Batiste.
Hesse's Organ Book, A. Hesse.
Album for Organists, W. E. Thayer.
The Organist's Reliance, W. E. Thayer.
The Classical Organist, J. T. Stone.
The Village Organist (London: Novello, Ewer & Co.)
Organist's Quarterly Journal, Dr. Wm. Spark.
Batiste's Organ Works, Edited by Dr. Spark.

The catalogues on the covers of these works will suggest many others.

REPERTOIRE OF ORGAN MUSIC.

For Organ Recitals and Concerts.

The following list of more than five hundred distinct pieces have been recently performed in public Organ Recitals and Concerts, in Europe and the United States, by the most eminent Organists. They represent selections from every school of composition—the Strict Classical, the Free School, adaptations and transcriptions from Orchestral Works and the very free style from Operatic Overtures. They may be ordered through any well known music house, as detached pieces in sheet music form. Each piece has been worthy of a public performance.

ADAM, A.
- Adeste Fideles Var.
- Overture, Le Brasseur de Preston.
- March, Religeuse.
- Organ Overture.

ALBRECHTSBERGER.
- Fugue in B minor.
- Fugue in E flat.

ARCADELT.
- Ave Maria, arr. by Liszt.

ARCHER, F.
- Concert Fugue in D.
- Andante in A.

ARNOLD.
- March from Ahab.

AUBER.
- Overture, Cheval du Bronze.
- " Les Diamants de la Cournne.
- " E Major.
- " Gustave.
- " Exhibition.
- " Masaniello.
- " La Barcarolle.
- " Zanetta.
- " Les Pre aux Clercs.

BACH, J. S.
- Prelude and Fugue in A minor.
- " " " B minor.
- " " " C minor.
- Toccata " " D minor.
- Prelude " " E minor.
- " " " G minor.
- Fantasie " " G minor.
- " in C minor.
- Fugue on "St. Ann's," in E flat.
- Passacaglia in C minor.
- Canzone.

BACH, J. S.
- Trio Sonata in C minor.
- " " C major.
- " " E flat.
- Choral Prelude on "Allein Gott in der Hoh sei Ehr."
- Fantasia in G.
- Prelude and Fugue in C.
- " " " in B flat.
- Musette in G minor.
- Gavotte in G major.
- Toccata in F.
- Prelude and Fugue in E.
- Prelude in "Nun Danket alle Gott."
- Prelude and Fugue in D major.
- Organ Concerto in A minor.
- Pastoral Symphony from the Christmas Oratorio.
- Pastoral in F.
- Bourree in B minor.
- Choral, "By the Waters of Babylon."
- Air, "My heart ever faithful."
- Saraband in A minor.
- Praeludium in C.

BACH, E. F.
- Allegro for the Organ.

BARBEIRI.
- Organ Overture in E flat.

BARGIEL.
- Marcia Fantastica

BATISTE, E.
- Communion in E minor, op. 4.
- Communion in G.
- Communion in E flat.
- Andante in G.
- Andante Sosteunto in F.

BATISTE, E.
- Four Offertoires de St. Cecile—
  - No. 1 in C minor.
  - No. 2 in D major.
  - No. 3 in F minor.
  - No. 4 in F major.
- Offertoire in A flat.
- Pilgrim's Song of Hope.
- Processional March.
- Caprice de Concert.
- Verset.

BEETHOVEN.
- Variations on air in G.
- Andante from Symphony in C minor.
- Adagio.
- Romance in F
- Hallelujah from "Engedi."
- Larghetto from Symphony in D
- Romance for Violin, op. 40.
- Funeral March in A flat minor.
- Theme, with variations, in A flat.
- Theme, with variations, in D.
- Gratulations Minuet.
- Introduction to "Mount of Olives."
- Overture to Egmont.
- Finale from the Fifth Symphony.
- Overture No. 3 to Leonora.
- Andante from Fifth Symphony.
- Allegretto to the Seventh Symphony.
- Overture to Fidelio.
- Largo in D minor.
- Triumphal March in Tarpeja.
- Turkish March, from "Ruins of Athens."
- Allegretto Scherzando, from the Eighth Symphony.
- Overture to Men of Prometheus.

BEHRENS, H.
- Fantasie in C minor.

BEST, W. T.
Pastorale in G.
Fantasie in E flat.
Andante in A.
Sonata in G.
March in A minor.
Andante con var. in F.
Allegro Giojoso in G.
Wedding March.
Funeral March.
Fantasie on a Welsh March.
March in D.
Allegro Marziale, op. 38.
Prelude on Stabat Mater.

BENNETT, W. S.
Pageant Music.
Minuette from Symphony in G minor.

BELLINI.
March from Il Pirata.

BIRCH, W. H.
Triumphal March.

BLUMENTHAL.
Andante Espressivo in E.

BOHLN.
Military Funeral March.

BOELDIEU.
Overture to La Dame Blanche.
Overture to Caliph of Bagdad.

BUCK, D.
Sonata in E flat, op. 22.
Wedding March.
Impromptu Pastorale.
Rondo Caprice, op. 30.

BUCK, D.
At Evening.
Var. on Star Spangled Banner.
Var. on Annie Laurie.

CALKIN, J. B.
Festal March.
Thanksgiving March.

CARMUSCI, D.
Air. Magnus Dominus.

CHERUBINI.
Overture to L'Hostelrie Portugaise.

CHOPIN, F.
Prelude in D flat, op. 28.
Funeral March.

CLARKE, W. H.
Concert Fantasia in C, for Organ Exhibitions.

CORELLI, A.
Sonata in A.
Pastorale in G.

COLLIN.
March in A.

COSTA.
March from Eli.
March from Naaman.
Overture to Eli.
Processional March.

COUPERIN.
Passacaille in B minor.

CROTCH.
Organ Concerto.

DEBERIOT.
Villanelle in G.

DELIOUX, C.
March Hongroise.

DESHAYES.
Andantino.

DONIZETTI.
Overture to Lucia di Lammermoor.
Overture to Don Pasquale.

ECKERT.
Andante in B minor

ELVEY, G.
Festal March.

ERNST.
Elegie.

FINK, C.
Sonata in E flat. ' No. 6.

FLOTOW.
Overture to Martha.
Overture to Stradella.

FRESCOBALDI.
Passacaglia in G.

FREYER, A.
Fantasia on a Russian Air.

FUMAGELLI, A.
Villanella in G minor.

GADE, N. W.
Allegretto in C.
Allegro in A minor.
Tonstuck, op. 22.

GIBBONS, ORLANDO.
Preludium in G.

GLUCK.
Overture to Iphigenia in Tauris.

GOUNOD, C.
Coronation March.
Prelude to Jean D'Arc.
Funeral March in Jean D'Arc.
Marche Cortege,
Marche Nuptiale.
Marche Romaine.
Funeral March of a Marionette.
March in La Reine de Saba.
Overture to Faust.

GOLDMARK.
Overture to Sokuntula.

GUILMANT, A.
Grand Chorus in D.
Marche Funebre et Chant Seraphique.
Allegretto in B minor.
Lamentation in D minor.
Romance Sans Paroles.
Fantasia on English Airs.
Cantiline Pastorale.
Marche Religieuse.
Prelude and Theme Var.
Priere in F.
Morceau de Concert, op. 24.
Invocation in B flat.
Antienne.

HANDEL, G. F.
Concerto No. 1 in G.
" No. 2 in B flat.
" No. 3 in G minor.
" No. 4 in F.
" No. 5 in F.
" No. 6 in B flat.
Overture to Samson.
" Occasional Oratorio.
" Messiah.
" Otho.
" Athalie.
" Esther.
Air. Wretched Lovers.
" Forever Blessed.
" Angels Ever Bright.
" Waft her, Angels.
" Ode to St. Cecilias' Day.
" Let me wander not unseen.
" Comfort Ye.
" He shall Feed His Flock.
" O Lovely Peace.
" Let the Bright Seraphim.
" Arm, Arm, Ye Brave.
Chorus. Swell the full chorus.
" The horse and his rider.
" The many rend the skies.
" See, the Conquering Hero comes.
" For unto us a Child is born.
Air. Forever blessed. Jeptha.
Chorus. Fixed in His everlasting seat.
" Hallelujah Chorus.
" May no rash intruder.
" We never will bow down.
Air. What tho' I trace.
Gavotte from Otho.
Gavotte in B flat.
Fugue in E minor.
Dead March in Saul.
Dead March from Samson.
Pastoral Symphony. Messiah.
Chorus. Then round about the starry throne.
Harmonious Blacksmith, Var.
Coronation Anthem.

HATTON, J. L.
Triumphal March.
Toccata in F sharp minor.

HAUPT.
Canonic Variations.
Concert Fugue in C.

HAYDN, J.
Allegretto in C major.
Andante from Third Symphony.
Air, varied in G minor.
Austrian National Hymn, Var.
Air from Symphony in D.
Andantino from Quartette in F.
Andante from Symphony in B flat.
Allegro from Symphony in D.
Andante from Fourth Symphony.
Largo from the Fourth Quartette.
Chorus, The Marvelous Work.
" The Heavens are Telling.
" Achieved is the Glorious Work.
Kyrie, from the First Mass.
Gloria, " "
Dona Nobis "
Seven Last Words.
Chorus, The Lord is Great.
Trio, On thee each living soul awaits.
Trio, Most beautiful appear.
Air, In native worth.
Selections from the Masses.

HESSE, A.
Variations in A.
God Save the Queen, Var.
Fantasia in E minor.
Toccata in A flat.
Choral Variation, "Jesus, meine Zuversicht."
Var. in A flat.

HIME, E. L.
Romance.

HERZOG.
Passacaglia in minor.

HILES, H.
Air, Varie in B flat.

HOPKINS, E. J.
Andante Grazioso.

HORSLEY, C. E.
War March in Gideon.
War March in David.

HUMMEL.
Romanza, op 108.

JENSEN.
Notturno, op. 45.
Bridal Song.

KIEL.
Fantasia in C sharp minor, op. 58.

KOEHLER.
Austrian Hymn.

KREBS, J. L.
Fugue in G.

KUHMSTEDT, F.
Sonata in C, op. 30.
Adagio from an organ Sonata.
Fantasia Eroica.
Nachspiel.

KULLAK.
Pastoral in F.
Romance Varie.

LANGE.
Cradle Song.

LACHNER.
Fest March.

LEMMENS, J.
Christmas Offertorium.
Fanfare, for Trumpets.
Hosannah.
Storm Fantasia in E minor.
March Triomphale.
Grand March Pontificale.
Priere in E.
Communion.
Scherzo.

LEYBACH, L.
Pastoral.

LISZT, F.
March, Hongroise.
Eclogue, Le Matin.
March of Crusaders.
Legende la Prediction aux Oiseaux.

LOEWE, C.
Overture to Guttenberg.

LUX.
O, Sanctissima, Var.
Fantasie de Concert, op. 29.

MAILLY.
Andante in B flat.

MARTINI.
Gavotte in F.

MENDELSSOHN, F.
Organ Sonata No. 1, F minor.
" " No. 2, C minor.
" " No. 3, A.
" " No. 4, B flat.
" " No. 5, F.
" " No. 6, D.
Prelude and Fugue No. 1, C minor.
" " No. 2, G.
" " No. 3, D minor.
Overture to Midsummer Night's Dream.
" in C minor.
" to Ruy Blas.
" St. Paul.
" Athalie.
" Elijah.
March from Cornelius.
Military March in A minor.
Canzonet, op. 12.
Allegretto and Adagio from Hymn of Praise.
Allegro Vivace from Reformation Symphony.
Hymn to Bacchus. Antigone.
Andante from Scotch Symphony.
" Italian "
Minuetto from the First "
Pilgrim March.
Priest's March in Athalie.
Adagio from the Third Symphony.
O, Rest in the Lord. Elijah.
Thanks be to God. "
If with all your hearts. "
O, great is the depth. St. Paul.
Volkslied from Songs Without Words.
Wedding March.
Andante from the Violin Concerto.
Concert Aria, op. 94.

McFARREN, G. A.
Andante in G.

MERKEL, G.
Sonata No. 2, G minor.
Adagio, op. 35.
Sonata No. 3, C minor.
Sonata in D minor, op. 30.
Variations in F, op. 45.
Canon in F sharp.
Pastorale.
Christmas Pastoral.
Adagio in E.

MEYERBEER.
Baptismal Song.
Coronation March.
Schiller March.
Overture to Les Huguenots.
Indian March in L'Africaine.
Sancta Maria. Dinorah.
Marcia Religiosa.
Marche aux Flambeaux.

MOLIQUE.
March from Abraham.

MORANDI.
Organ Overture.

MOZART.
Fantasie in F minor.
Fugue in D major.
Larghetto, op. 103.
Lachrymosa from Requiem.
Andante and Finale.
Adagio from Third Quartette.
Larghetto from Ninth Symphony.
Deus Tibi.
Minuet and Trio from Symphony in E flat.
Quartette in B flat.
Benedictus from the Requiem.
Agnus Dei from First Mass.
Andante from the Fifth Quintette.
Andante from the Jupiter Symphony.
Fantasia and Fugue in C.

MOZART.
- Andante in D minor.
- Larghetto from the Clarinet Quintett.
- Overture to Marriage of Figaro.
- Kyrie and Gloria from Twelfth Mass.
- Andante from Symphony in C.
- Overture to Zauberflote.
- " Don Juan.
- Selections from the Masses, from the 1st to the 16th.
- March in Zauberflote.

NEUKOMM.
- Storm Fantasia, "A concert on a lake, interrupted by a storm."

OZADE.
- Moderato in F, op. 22.

PALESTRINA.
- Lamentatio in Parasceve.
- Kyrie.
- Sanctus.

PERGOLESI.
- Gloria in Excelsia.
- Sanctum et Terrible.

PETRI, J. F.
- Fantasie in G minor.

PLEYEL.
- Adagio from Twelfth Symphony.

PROUT.
- Andante.

RAFF.
- Pastorale, "Ranz des Vaches."
- Fugue in C minor.

READ.
- Offertoire in A flat.

REISSIGER, C. G.
- Choral Fugue.
- Overture to Yelva.

REUBKE.
- Sonata on the 94th Psalm.

REYLOFF.
- Gavotte.

RHEINBERGER.
- Fantasia in F minor.
- Fantasia Sonata, op. 65.

RINCK, C. H.
- Flute Concerto in F.
- Allegro Con brio, A flat.
- Variations on God Save the Queen.
- Andante with Var. in E flat.
- Fugue on B, A, C, H.

RICHTER.
- Fantasie and Fugue, op. 19.

RITTER.
- Sonata in A minor.
- " D minor.
- " E minor.

RODE, B.
- Air with Variations.

ROECKEL, J. L.
- Air Du Dauphin.

ROMBERG.
Andante from Symphony in D flat.

ROSSINI.
Air. Crucifixus.
" Pro Peccatis.
" Cujus Animam
Chorus. Inflammatus.
La Carita.
Overture to Othello.
" The Barber of Seville.
" La Cenerentola.
" Siege of Corinth.
" Tancredi.
" L'Italiana in Algeria.
" L'Ingammo Felice.
" William Tell.
" Semiramide.
Triumphal March from Siege of Corinth.
Willow Song from Othello.

SAINT-SAENS.
Rhapsodie Sur Cantique Breton.
Andante.
Benediction Nuptiale.

SALOME.
Marcia Religosa and Pastorale.
Pastorale et Grand Chorus.

SCHMIDT.
Offertoire in D minor.

SCHUMANN, R.
Evening Music.
Quick March.
Fugue on B, A, C, H.
Romanza from Symphony in D minor.
Traeumerei.

SCHUBERT.
March in B minor
Ungeduld.
Andante in E.
Overture to Rosamunde.
Andante in G.
March Heroic in C.
Adagio, from Quartette in B flat.
Ave Maria.
Serenade.
Elegy of Tears.

SCARLATTI.
Canzonetta

SCHNEIDER, J.
Fantasie and Fugue in D minor, op. 3.

SCHULTZ, F.
Marche de Parade, op. 31.

SILAS E.
Andante in D.
March from Joash.

SMART, H.
Evening Prayer in A.
Allegro Maestoso in D.
Solemn March in E flat.
March in G.
Allegro Pomposo in G.
Air, with variations.
Andante Grazioso in G.

SOMERVIEL.
Overture to the Prisoner of Chillon.

SPARK, WM.
Concert Fantasie in B minor.
Echoes of the Lake.

SPARK, WM.
Festal March in E flat.
Jerusalem the Golden, Var.
Fantasia in B.

SPOHR, L.
Romanza on Rose Softly Blooming.
Overture to Jessonda.
Overture to Fall of Babylon.
Quartette in G minor.
Andantino from The Power of Sound.
Introduction to Third Symphony.
Chorus, Give Thanks to God.
" Out of the Deep.

STARK, H. J.
Allegro Maestoso.

STEWART, R.
Fantasie in D minor.

SUPPE.
Overture to Poet and Peasant.

THIELE, A.
Theme and Variations in A flat.
Concert satz in C minor.
Chromatic Fantasie and Fugue.
Theme and Variations in C.

TOPFER, J. G.
Concertstuck in C minor.
Var. on Vive Henri Quartre.

TOMS.
Allegretto.

ULRICH.
Adagio from Symphonic Triumphale.

VAN EYKEN.
Sonata in D minor, op. 15.

VERDI.
Agnus Dei.
March Triomphale from Don Carlos.
Overture to Nabucodonsor.

VIVIANI.
Silver Trumpets.
Andante Religioso.

VOGT.
Nachtgesang.

VOLKMAR, W.
Adagio.
Fest Vor Spiel.

WAGNER, R.
Prelude to Lohengrin.
Bridal Chorus in Lohengrin.
Overture to Tannhauser.

WEBER, C. M.
Overture to Oberon.
" Abou Hassan.
" Euryanthe.
" Der Freischutz.
Jubilee Overture.
Allegro Marziale in C.
Romanza, Lonely tho' I wander.
Song of the Mermaids.

WELY-LEFEBURE.
Offertoire No. 1, B flat,
" No. 2, F.
" No. 3, C.
" No. 4, G.
" No. 5, A.
" No. 6, C minor.
" for Christmas.
Postludium in E flat.
Storm Pastorale.
Meditation Religieuse.
Allegro in E flat.
Arabian March.
March Militaire.

WIDOR, C. M.
Allegro in F.
Pastorale.
Finale to Fourth Organ Symphony.

WESLEY, S. S.
Andante in E flat.
National Anthem.
Andante in F sharp minor.

SPECIFICATIONS.

The specifications appended are graded from the smallest effective One-Manual Organ to the highest class Three-Manual instruments, and have been prepared from a long experimental acquaintance with organs of every class.

As Church Organs are made especially for their final position, and as the method of the interior arrangement of the mechanism determines somewhat the cost of manufacture, the valuation of the following schemes can not be definitely given without a knowledge of the space which would be allotted, as two organs are seldom similarly laid out in their mechanism.

Small Two-Manual Organs require at least four months for their construction, while large Two and Three-Manual instruments require from six to twelve months. The largest Four-Manual Organs require from three to five years, even with the modern facilities of machinery adapted to execute the work.

In the construction of a Pipe Organ, it is first completed in the large exhibition room of the manufactory, and tuned and thoroughly tested. It is then taken down and carefully packed in boxes and loaded at the railway, and competent men are sent to set it up in the church. On its completion in the church, it is generally "opened" with an attractive Organ Recital, displaying its powers in the different schools of organ music.

By copying one of the following schedules, and corresponding with a first-class organ builder, giving the dimensions, desired location of the key-board and general style of the case, a definite valuation of the scheme will be obtained, both delivered on the cars and also completed in the church. Where a committee is desirous, an itemized specification is sometimes furnished, giving the value of each set of Pipes, Wind-chests, Action-work of the Manuals and Pedals, Bellows, Wind-trunks, Swell-box, Key-boards, Case, Packing, Freight,

Setting Up, Tuning, etc., a custom in vogue with the organ builders of Germany.

A conscientious church organ builder will not yield to the proffers of influential services in securing contracts by paying commissions to a third party, for at the legitimate price he has estimated for executing the work faithfully, he could not do so in justice to himself or to the church authorities. If the latter will be better satisfied to employ a competent person to investigate and aid them in the negotiation, they must not expect the builder to remunerate him for services rendered them, which he could not do without lessening the value of the contract.

Church organ-builders who are known for their honorable transactions and excellency of their work, do not employ agents or pay commissions. Organists and musical people who speak highly of their efforts do so voluntarily from their experience with the intrinsic merits which their instruments possess.

CONTRACTS between the organ-builder and the church committee are generally in the following form:

Contract between ....., Organ-Builder of..... Party of the First Part, and ..... (names of church and Trustees), Party of the Second Part, made this day ....., to-wit:

The Party of the First Part shall build an Organ according to the specifications herein indicated, of the best materials, and in the most thorough manner, and deliver it ....., and set it up in ..... in good order, ready for use, warranted in every respect, during the month of .....

The Party of the Second Part, in full consideration for the above, shall pay to the Party of the First Part, upon the completion of the organ in ....., the sum of ....., and grant the Party of the First Part exclusive control of the auditorium ..... days during the process of tuning, and keep the room at the requisite temperature if in cold weather, during the setting up and tuning.

All risk of damage to the organ or parts thereof by fire shall be incurred by the party of the second part after the organ, or parts thereof, have been delivered in the church.

The *warrant* of a pipe organ generally extends one year from the time of completion in the church, testing its thoroughness of construction through all the changes of climate, with natural and artificial heat. It does not include slight necessary adjustments and tuning, but covers the durability of the works and freedom from defects, for which the builder is responsible. It also includes proper care and legitimate use, and every means of protection from dampness on the part of the church authorities.

If the contract has been faithfully executed according to the details recorded therein in every particular, settlement is made after the organ has been publicly tested.

If it is not according to the agreement, and is defective, payment should be withheld until it is made satisfactory, or the instrument removed at the expense of the builder.

Some organ builders require payments as follows: One-third of the amount to be paid when the contract is signed, one-third on the completion of the organ at the manufactory, and the remaining third when the organ is completed in the church.

SPECIFICATION I.

SINGLE MANUAL WITHOUT PEDALS.

Compass of Manual from C_0 to c^4 . . . . . 61 notes.
Total number of pipes. 232
Total number of draw stop knobs 8

1.	16 ft.	tone	Bourdon Bass, wood	12	pipes.
2.	8 ft.	"	Open Diapason, metal from C°	49	"
3.	8 ft.	"	St. Diapason Bass, wood	12	"
4.	8 ft.	"	Gedeckt, or Melodia Treble, wood	49	"
5.	8 ft.	"	Dulciana from C°—metal	49	"
6.	8 ft.	"	Octave, through in metal	61	"
7.			Tremolo.		
8.			Bellows Signal.		

All the pipes enclosed in an effective swell, excepting the Bourdon Bass.

SPECIFICATION II.

SINGLE MANUAL WITH PEDALS.

Compass of Manual from C_0 to c^4 . . . . . 61 notes
" Pedals " C_0 to D . . . . . 27 "
Total number of speaking pipes 320
Total number of draw-stop knobs 12

1.	8 ft.	tone	Open Diapason, through in metal with speaking fronts	61	pipes
2.	8 ft.	"	St. Diapason Bass, wood	12	"
3.	8 ft.	"	Melodia Treble, wood	49	"
4.	8 ft.	"	Dulciana, from C° in metal	49	"
5.	4 ft.	"	Octave, through in metal	61	"
6.	4 ft.	"	Flute Octaviante, through in metal	61	"
7.	16 ft.	"	Pedal Bourdon, wood	27	"
8.			Manual Octave Coupler.		
9.			Coupler Manual to Pedals.		
10.			Bellows Signal.		
11.			Tremolo.		
12.			Pedal Check.		

All enclosed in an effective swell, excepting the 8 ft. Open Diapason and the Pedal Bourdon

SPECIFICATION III.

SINGLE MANUAL WITH PEDALS.

Compass of Manual from C_o to c^4 . . . . . 61 notes.
Compass of Pedals from C_o to D . . . . . 27 "

Total number of speaking pipes 491
Total number of draw-stop knobs 14

MANUAL.

1.	16	ft.	tone	Manual Bourdon, from C° in wood	49	pipes.
2.	8	ft.	"	Open Diapason, through in metal, with speaking fronts	61	"
3.	8	ft.	"	St. Diapason Bass, wood	12	"
4.	8	ft.	"	Melodia Treble, wood	49	"
5.	8	ft.	"	Dulciana, from C° in metal	49	"
6.	4	ft.	"	Octave, metal	61	"
7.	4	ft.	"	Flute Octaviante, metal	61	"
8.	$2\frac{2}{3}$	ft.	"	Octave Quint, metal	61	"
9.	2	ft.	"	Super Octave, metal	61	"

PEDAL CLAVIER.

10.	16	ft.	tone	Pedal Bourdon, wood	27	pipes.

MECHANICAL.

11. Coupler Manual and Pedals.
12. Tremolo.
13. Bellows Signal.
14. Pedal Check.

COMPOSITION PEDALS.

1. Forte, bringing on all the Manual Stops.
2. Piano, reducing to the softest stops.

All the pipes to be enclosed in an effective swell, excepting the 8 ft Open Diapason and Pedal Bourdon.

SPECIFICATION IV.

TWO MANUALS WITH PEDALS.

Compass of Manuals from C_0 to c^4 . . . . . 61 notes.
Compass of Pedals from C_0 to D . . . . . 27 "

Total number of pipes 662
Total number of draw-stop knobs 20

LOWER MANUAL.

1.	8	ft. tone	Open Diapason, lower pipes in front,	metal	61 pipes.
2.	8	ft. "	Dulciana, from C° in	metal	49 "
3.	8	ft. "	St. Diapason Bass,	wood	12 "
4.	8	ft. "	Melodia Treble,	wood	49 "
5.	4	ft. "	Octave,	metal	61 "
6.	2⅔	ft. "	Octave Quint,	metal	61 "
7.	2	ft. "	Super Octave,	metal	61 "

UPPER MANUAL.

8.	16	ft. tone	Manual Bourdon, from C° in	wood	49 pipes.
9.	8	ft. "	Unison Bass,	wood	12 "
10.	8	ft. "	Gedeckt Treble,	wood	49 "
11.	8	ft. "	Salicional, from C°,	metal	49 "
12.	4	ft. "	Flute Octaviante,	metal	61 "
13.	2	ft. "	Flageolet,	metal	61 "

PEDAL CLAVIER.

14.	16	ft. tone	Bourdon Sub-Bass,	wood	27 pipes.

MECHANICAL.

15. Coupler Lower Manual to Ped.
16. Coupler Upper Manual to Ped.
17. Manual Coupler.
18. Tremolo.
19. Bellows Signal.
20. Pedal Check.

COMPOSITION PEDALS.

1. Forte.
2. Piano.
3. Reversible Coupler, Lower Manual to Ped.

All the pipes of both manuals, excepting the Open Diapason, enclosed in an effective swell, thus giving the facility of swelling the solo stops as well as the accompaniment, giving greater expressive power than in ordinary schemes.

This specification gives the three varieties of tones: The Organ Tone, Flute Tone, and String Tone, and is very effective in combination when a small Two-Manual Organ is desired, and the distance is remote from an organ manufactory, as the omission of the Reed Tone is an assurance that the pipes will seldom require tuning. The works will fit in a space 6 ft. 3 in. deep and 10 ft. wide; the internal works 12 ft. high; the front case and front pipes 17½ ft. high, with ample speaking-room for all the pipes, when the work is properly laid out, with 8 ft. chests. The Open Diapason being outside the swell, a powerful foundation-work is given to the full organ. In this specification, the Dulciana would be voiced the softest, to serve as an accompaniment to the Flute Octaviante, when used as a solo, and the Salicional of greater strength, to give more character to the combinations which, with the arrangement as indicated in the specification, would be innumerable. Quite an effective Organ Recital could be given with this scheme, on account of its variety and power, rendering it just the kind of instrument an organ student would delight to use in the preparation of his music.

SPECIFICATION V.

Compass of Manuals from C_o to c^4 . . . . . 61 notes.
Compass of Pedals from C_o to D . . . . . 27 "

GREAT MANUAL.

1.	8	ft.	tone	Open Diapason,	metal	61	pipes.
2.	8	ft.	"	Dulciana,	metal	49 or 61	"
3.	8	ft.	"	St. Diapason Bass,	wood	12	"
4.	8	ft.	"	Melodia Treble,	wood	49	"
5.	4	ft.	"	Octave,	metal	61	"
6.	4	ft.	"	Wald Flute,	wood	61	"

SWELL MANUAL.

7.	8	ft.	tone	Viola Diapason,	metal, 12 lower pipes of st. wood .	61	pipes.
8.	8	ft.	"	Salicional,	metal	49 or 61	"
9.	8	ft.	"	Unison Bass	wood	12	"
10.	8	ft.	"	Gedeckt Treble,	wood	49	"
11.	4	ft.	"	Flute Harmonique,	metal	61	"
12.	2	ft.	"	Flageolet,	metal	61	"

PEDAL CLAVIER.

13.	16	ft.	tone	Bourdon Sub-Bass,	wood	27	pipes.
14.	8	ft.	"	Pedal Flute,	wood	27	"

MECHANICAL.

15. Coupler Swell to Great.
16. Coupler Great to Pedal.
17. Coupler Swell to Pedal.
18. Swell Tremolo.
19. Bellows Signal.
20. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler Great to Pedal.
4. Adjustable Swell Pedal.

Wind Gauge.

SPECIFICATION VI.

Compass of Manuals from C_0 to c^4 . . . . . 61 notes.
Compass of Pedals from C_0 to D . . . . . 27 "

GREAT MANUAL.

1.	16	ft.	tone	Bourdon,	wood . . . . . 49 or	61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft.	"	Dulciana,	metal . . . . . 49 or	61	"
4.	8	ft.	"	St. Diapason Bass,	wood	12	"
5.	8	ft.	"	Melodia Treble,	wood	49	"
6.	4	ft.	"	Octave,	metal	61	"
7.	$2\frac{2}{3}$	ft.	"	Octave Quint,	metal	61	"
8.	2	ft.	"	Super Octave,	metal	61	"

SWELL MANUAL.

9.	8	ft.	tone	Viola Diapason,	metal (and wood)	61	pipes.
10.	8	ft.	"	Salicional,	metal . . . . . 49 or	61	"
11.	8	ft.	"	Unison Bass,	wood	12	"
12.	8	ft.	"	Gedeckt Treble,	wood	49	"
13.	4	ft.	"	Flute Harmonique,	metal	61	"
14.	2	ft.	"	Flageolet,	metal	61	"

PEDAL CLAVIER.

15.	16	ft.	tone	Bourdon Sub-Bass,	wood	27	pipes.
16.	8	ft.	"	Pedal Flute,	wood	27	"

MECHANICAL.

17. Coupler Swell to Great.
18. Coupler Great to Pedal.
19. Coupler Swell to Pedal.
20. Swell Tremolo.
21. Bellows Signal.
22. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler Grt. to Ped.
4. Adjustable Swell Pedal.

Wind Gauge.

SPECIFICATION VII.

Compass of Manuals from C_o to c^4 . . . . . 61 notes.
Compass of Pedals from C_o to D . . . . . 27 "

GREAT MANUAL.

1.	16	ft.	tone	Bourdon,	wood	49 or 61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft.	"	Dulciana,	metal	49 or 61	"
4.	8	ft.	"	St. Diapason Bass,	wood	12	"
5.	8	ft.	"	Melodia Treble,	wood	49	"
6.	4	ft.	"	Octave,	metal	61	"
7.	4	ft.	"	Flute d'Amour,	metal	61	"
8.	$2\frac{2}{3}$	ft.	"	Octave Quint,	metal	61	"
9.	2	ft.	"	Super-Octave,	metal	61	"

SWELL MANUAL.

10.	8	ft.	tone	Viola Diapason,	metal (lower 12 pipes of wood) .	61	pipes.
11.	8	ft.	"	Salicional,	metal	49 or 61	"
12.	8	ft.	"	Unison Bass,	wood	12	"
13.	8	ft.	"	Gedeckt Treble,	wood	49	"
14.	4	ft.	"	Flute Harmonique,	metal	61	"
15.	2	ft.	"	Flageolet,	metal	61	"
16.	8	ft.	"	Oboe,	metal, with reed	49 or 61	"

PEDAL CLAVIER.

17.	16	ft.	tone	Bourbon Sub-Bass,	wood	27	pipes.
18.	8	ft.	"	Pedal Flute,	wood	27	"

MECHANICAL.

19. Coupler Swell to Great.
20. Coupler Great to Pedal.
21. Coupler Swell to Peda'
22. Swell Tremolo.
23. Bellows Signal.
24. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Great to Pedal.
4. Adjustable Swell Pedal.

Wind Gauge.

SPECIFICATION VIII.

Compass of Manuals from C_0 to c^4 . . . . . 61 notes.
Compass of Pedals from C_0 to D . . . . . 27 "

GREAT MANUAL.

1.	16	ft	tone	Tibia Major,	wood . . . . . 49 or 61	pipes.
2.	8	ft.	"	Open Diapason,	metal 61	"
3.	8	ft.	"	Dulciana,	metal . . . . . 49 or 61	"
4.	8	ft.	"	St. Diapason Bass,	wood 12	"
5.	8	ft.	"	Melodia Treble,	wood 49	"
6.	4	ft.	"	Octave,	metal 61	"
7.	4	ft.	"	Flute d'Amour,	metal 61	"
8.	$2\frac{2}{3}$	ft.	"	Octave Quint,	metal 61	"
9.	2	ft.	"	Super Octave,	metal 61	"
10.	3	rank		Mixture,	metal 183	"

SWELL MANUAL.

11.	8	ft.	tone	Viola Diapason,	metal and wood 61	pipes.
12.	8	ft.	"	Salicional,	metal 61	"
13.	8	ft.	"	Unison Bass,	wood 12	"
14.	8	ft.	"	Gedeckt Treble,	wood 49	"
15.	4	ft.	"	Flute Harmonique,	metal 61	"
16.	2	ft.	"	Flageolet,	metal 61	"
17.	8	ft.	"	Oboe,	metal with reed 49	"
18.	8	ft.	"	Bassoon,	metal with reed 12	"

PEDAL CLAVIER.

19.	16	ft.	tone	Open Diapason,	wood 27	pipes.
20.	16	ft.	"	Bourdon Sub-Bass,	wood 27	"

MECHANICAL.

21. Coupler Swell to Great.
22. Coupler Great to Pedal.
23. Coupler Swell to Pedal.
24. Swell Tremolo.
25. Bellows Signal.
26. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler Grt. to Ped.
4. Adjustable Swell Pedal.
   Wind Gauge.

SPECIFICATION IX.

GREAT MANUAL.

1.	16	ft. tone	Tibia Major,	wood	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3.	8	ft. "	Dulciana,	metal	61	"
4.	8	ft. "	St. Diapason Bass,	wood	12	"
5.	8	ft. "	Melodia Treble,	wood	49	"
6.	4	ft. "	Octave,	metal	61	"
7.	4	ft. "	Flute d'Amour,	metal	61	"
8.	$2\frac{2}{3}$	ft. "	Octave Quint,	metal	61	"
9.	2	ft. "	Super-Octave,	metal	61	"
10.	3	rank	Mixture,	metal	183	"
11.	8	ft. tone	Trumpet,	metal, with reed	61	"

SWELL MANUAL.

12.	8	ft. tone	Viola Diapason,	metal and wood	61	pipes.
13.	8	ft. "	Salicional,	metal	61	"
14.	8	ft. "	Unison Bass,	wood	12	"
15.	8	ft. "	Gedeckt Treble,	wood	49	"
16.	4	ft. "	Flute Harmonique,	metal	61	"
17.	2	ft. "	Flageolet,	metal	61	"
18.	8	ft. "	Oboe,	metal, with reed	49	"
19.	8	ft. "	Bassoon,	metal, with reed	12	"

PEDAL CLAVIER.

20.	16	ft. tone	Open Diapason,	wood	27	pipes.
21.	16	ft. "	Bourdon,	wood	27	"
22.	8	ft. "	Violoncello,	metal	27	"

MECHANICAL.

23. Coupler Swell to Great.
24. Coupler Great to Pedal.
25. Coupler Swell to Pedal.
26. Swell Tremolo.
27. Bellows Signal.
28. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Great to Pedal.
4. Adjustable Swell Pedal.

Wind Gauge.

SPECIFICATION X.

GREAT MANUAL.

1.	16	ft.	tone	Tibia Major,	wood	61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft.	"	Dulciana,	metal	61	"
4.	8	ft.	"	Doppel Flote,	wood	61	"
5.	4	ft.	"	Octave,	metal	61	"
6.	4	ft.	"	Traverse Flute,	wood	61	"
7.	2⅔	ft.	"	Octave Quint,	metal	61	"
8.	2	ft.	"	Super Octave,	metal	61	"
9.	3	rank		Mixture,	metal	163	"
10.	8	ft.	tone	Trumpet,	metal with reed	61	"

SWELL MANUAL.

11.	16	ft.	"	Bourdon Bass,	wood	12	pipes.
12.	16	ft.	"	Lieblich Bourdon Treble,	wood	49	"
13.	8	ft.	"	Viola Diapason,	metal	61	"
14.	8	ft.	"	Salicional,	metal	61	"
15.	8	ft.	"	St. Diapason Bass,	wood	12	"
16.	8	ft.	"	Gedeckt Treble,	wood	49	"
17.	4	ft.	"	Violin,	metal	61	"
18.	4	ft.	"	Flute Harmonique,	metal	61	"
19.	2	ft.	"	Flageolet,	metal	61	"
20.	8	ft.	"	Oboe,	metal with reed	49	"
21.	8	ft.	"	Bassoon	metal with reed	12	"

PEDAL CLAVIER.

22.	16	ft.	tone	Open Diapason,	wood	27	pipes.
23.	16	ft.	"	Bourdon Sub-Bass,	wood	27	"
24.	8	ft.	"	Violoncello,	metal	27	"

MECHANICAL.

25. Coupler Swell to Great.
26. Coupler Great to Pedal.
27. Coupler Swell to Pedal.
28. Swell Tremolo.
29. Bellows Signal.
30. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Grt. to Ped.
4. Adjustable or Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XI.

GREAT MANUAL.

1.	16 ft.	tone	Tibia Major,	wood	61	pipes.
2.	8 ft.	"	Open Diapason,	metal	61	"
3.	8 ft.	"	Dulciana,	metal	61	"
4.	8 ft.	"	Viola da Gamba,	metal	61	"
5.	8 ft.	"	Dopple Flote,	wood	61	"
6.	4 ft.	"	Octave,	metal	61	"
7.	4 ft.	"	Traverse Flute,	wood	61	"
8.	$2\frac{2}{3}$ ft.	"	Octave Quint,	metal	61	"
9.	2 ft.	"	Super-Octave,	metal	61	"
10.	3 rank		Mixture,	metal	183	"
11.	8 ft.	tone	Trumpet,	metal, with reed	61	"

SWELL MANUAL.

12.	16 ft.	"	Bourdon Bass,		12	pipes.
13.	16 ft.	"	Lieblich Bourdon Treble,		49	"
14.	8 ft.	"	Viola Diapason		61	"
15.	8 ft.	"	Salicional		61	"
16.	8 ft.	"	St. Diapason Bass,		12	"
17.	8 ft.	"	Gedeckt Treble,		49	"
18.	4 ft.	"	Violin		61	"
19.	4 ft.	"	Flute Harmonique		61	"
20.	2 ft.	"	Flageolet		61	"
21.	3 rank		Echo Mixture		183	"
22.	8 ft.	"	Oboe,		49	"
23.	8 ft.	"	Bassoon,		12	"

PEDAL CLAVIER.

24.	16 ft.	tone	Open Diapason,	wood	27	pipes.
25.	16 ft.	"	Bourdon Sub-Bass,	wood	27	"
26.	8 ft.	"	Violoncello,	metal	27	"

MECHANICAL.

27. Coupler Swell to Great.
28. Coupler Great to Pedal.
29. Coupler Swell to Pedal.
30. Swell Tremolo.
31. Bellows Signal.
32. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Great to Pedal.
4. Adjustable or Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XII.

GREAT MANUAL.

1.	16	ft.	tone	Tibia Major,	wood	61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft.	"	Dulciana,	metal	61	"
4.	8	ft.	"	Viola da Gamba,	metal	61	"
5.	8	ft.	"	Doppel Flote,	wood	61	"
6.	4	ft.	"	Octave,	metal	61	"
7.	4	ft.	"	Traverse Flute,	wood	61	"
8.	$2\frac{2}{3}$	ft.	"	Octave Quint,	metal	61	"
9.	2	ft.	"	Super Octave,	metal	61	"
10.	3	rank		Mixture,	metal	183	"
11.	8	ft.	"	Trumpet,	metal	61	"

SWELL MANUAL.

12.	16	ft.	"	Bourdon Bass,		12	pipes.
13.	16	ft.	"	Lieblich Bourdon Treble,		49	"
14.	8	ft.	"	Viola Diapason,		61	"
15.	8	ft.	"	Salicional,		61	"
16.	8	ft.	"	St. Diapason Bass,		12	"
17.	8	ft.	"	Gedeckt Treble,		49	"
18.	4	ft.	"	Principal,		61	"
19.	4	ft.	"	Violin,		61	"
20.	4	ft.	"	Flute Harmonique,		61	"
21.	2	ft.	"	Flageolet,		61	"
22.	3	rank		Echo Mixture,		183	"
23.	8	ft.	"	Oboe,		49	"
24.	8	ft.	"	Bassoon,		12	"

PEDAL CLAVIER.

25.	16	ft.	tone	Open Diapason,	wood	27	pipes
26.	16	ft.	"	Bourdon Sub-Bass,	wood	27	"
27.	8	ft.	"	Violoncello,	metal	27	"
28.	4	ft.	"	Pedal Super Octave,	metal	27	"

MECHANICAL.

29. Coupler Swell to Great.
30. Coupler Great to Pedal.
31. Coupler Swell to Pedal.
32. Swell Tremolo.
33. Bellows Signal.
34. Pedal Check.

PEDAL MOVEMENT.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Grt. to Ped.
4. Adjustable or Balanced Crescendo.

Wind Gauge.

SPECIFICATION XIII.

GREAT MANUAL.

1.	16	ft.	tone	Tibia Major,	wood	61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft	"	Dulciana,	metal	61	"
4.	8	ft.	"	Viola Da Gamba,	metal	61	"
5.	8	ft.	"	Doppel Flote,	wood	61	"
6.	4	ft.	"	Octave,	metal	61	"
7.	4	ft.	"	Traverse Flute,	wood	61	"
8.	2⅔	ft.	"	Octave Quint,	metal	61	"
9.	2	ft.	"	Doublette,	metal	61	"
10.	3	rank		Mixture,	metal	183	"
11.	8	ft.	tone	Trumpet,	metal	61	"

SWELL MANUAL.

12.	16	ft.	"	Bourdon Bass,	wood	12	pipes.
13.	16	ft.	"	Bourdon Treble,	wood	49	"
14.	8	ft.	"	Viola Diapason,	metal	61	"
15.	8	ft.	"	Salicional,	metal	61	"
16.	8	ft.	"	St. Diapason Bass,	wood	12	"
17.	8	ft.	"	Gedeckt Treble,	wood	49	"
18.	4	ft.	"	Principal,	metal	61	"
19.	4	ft.	"	Violin,	metal	61	"
20.	4	ft.	"	Flute Harmonique,	metal	61	"
21.	2	ft.	"	Flageolet,	metal	61	"
22.	3	rank		Echo Mixture,	metal	183	"
23.	8	ft.	"	Clarinet,	metal	49 or 61	"
24.	8	ft.	"	Oboe,	metal	49	"
25.	8	ft.	"	Bassoon,	metal	12	"

PEDAL CLAVIER.

26.	16	ft.	tone	Open Diapason,	wood	27	pipes.
27.	16	ft.	"	Bourdon Sub-Bass,	wood	27	"
28.	8	ft.	"	Violoncello,	metal	27	"
29.	10⅔	ft.	"	Quintolophon,	wood	27	"
30.	4	ft.	"	Super Octave,	metal	27	"

MECHANICAL.

31. Coupler Swell to Great.
32. Coupler Great to Pedal.
33. Coupler Swell to Pedal.
34. Swell Tremolo.
35. Bellows Signal.
36. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Grt. to Ped.
4. Adjustable or Balanced Cres. Ped.

Wind Gauge.

SPECIFICATION XIV.

GREAT MANUAL.

1.	16	ft.	tone	Tibia Major,	wood	61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft.	"	Dulciana,	metal	61	"
4.	8	ft.	"	Gamba,	metal	61	"
5.	8	ft.	"	Dopple Flote,	wood	61	"
6.	4	ft.	"	Octave,	metal	61	"
7.	4	ft.	"	Traverse Flute,	wood	61	"
8.	$2\frac{2}{3}$	ft.	"	Nasard,	metal	61	"
9.	2	ft.	"	Doublette,	metal	61	"
10.	3	rank		Clear Mixture,	metal	183	"
11.	3	rank		Acuta Mixture,	metal	183	"
12.	8	ft.	"	Clarinet,	metal . . . . . 49 or	61	"
13.	8	ft.	"	Trumpet,	metal	61	"

SWELL MANUAL.

14.	16	ft.	"	Bourdon Bass,	wood	12	"
15.	16	ft.	"	Bourdon Treble,	wood	49	"
16.	8	ft.	"	Viola Diapason,	metal	61	"
17.	8	ft.	"	Salicional,	metal	61	"
18.	8	ft.	"	St. Diapason Bass,	wood	12	"
19.	8	ft.	"	Gedeckt Treble,	wood	49	"
20.	4	ft.	"	Principal,	metal	61	"
21.	4	ft.	"	Violin,	metal	61	"
22.	4	ft.	"	Flute Harmonique,	metal	61	"
23.	2	ft.	"	Flageolet,	metal	61	"
24.	3	rank		Echo Mixture,	metal	183	"
25.	8	ft.	tone	Cornopæan,	metal	61	"
26.	8	ft.	"	Oboe,	metal	49	"
27.	8	ft.	"	Bassoon,	metal	12	"

PEDAL CLAVIER.

28.	16	ft.	tone	Open Diapason,	wood	27	pipes.
29.	16	ft.	"	Bourdon Sub-Bass,	wood	27	"
30.	8	ft.	"	Violoncello,	metal	27	"
31.	$10\frac{2}{3}$	ft.	"	Quintolophon,	wood	27	"
32.	4	ft.	"	Super Octave,	metal	27	"

MECHANICAL.

33 Coupler Swell to Great.
34 Coupler Great to Pedal.
35. Coupler Swell to Pedal.
36. Swell Tremolo.
37. Bellows Signal.
38. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Great to Pedal.
4. Adjustable or Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XV.

GREAT MANUAL.

1.	16	ft. tone	Double Open Diapason,	metal	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3.	8	ft. "	Dulciana,	metal	61	"
4.	8	ft. "	Gamba,	metal	61	"
5.	8	ft. "	Doppel Flote,	wood	61	"
6.	8	ft. "	Melodia,	wood	61	"
7.	4	ft. "	Octave,	metal	61	"
8.	4	ft. "	Concert Flute,	wood	61	"
9.	2⅔	ft. "	Nasard,	metal	61	"
10.	2	ft. "	Doublette,	metal	61	"
11.	3	ranks	Clear Mixture,	metal	183	"
12.	3	ranks	Acuta Mixture,	metal	183	"
13.	8	ft. tone	Clarinet,	metal	49 or 61	"
14.	8	ft. "	Trumpet,	metal	61	"

SWELL MANUAL.

15.	16	ft. "	Bourdon Bass,	wood	12	pipes.
16.	16	ft. "	Bourdon Treble,	wood	49	"
17.	8	ft. "	Viola Diapason,	metal	61	"
18.	8	ft. "	Salicional,	metal	61	"
19.	8	ft. "	St. Diapason Bass,	wood	12	"
20.	8	ft. "	Gedeckt Treble,	wood	49	"
21.	4	ft. "	Principal,	metal	61	"
22.	4	ft. "	Violin,	metal	61	"
23.	4	ft. "	Flute Harmonique,	metal	61	"
24.	2	ft. "	Flageolet,	metal	61	"
25.	3	ranks	Echo Mixture,	metal	183	"
26.	8	ft. tone	Cornopæan,	metal	61	"
27.	8	ft. "	Oboe,	metal	49	"
28.	8	ft. "	Bassoon,	metal	12	"

PEDAL CLAVIER.

29.	16	ft. tone	Open Diapason,	wood	27	pipes.
30.	16	ft. "	Bourdon,	wood	27	"
31.	10⅔	ft. "	Quintolophon,	wood	27	"
32.	8	ft. "	Violoncello,	metal	27	"
33.	4	ft. "	Super Octave,	metal	27	"
34.	16	ft. "	Trombone,	reed	27	"

MECHANICAL.

35. Coupler Swell to Great.
36. Coupler Great to Pedal.
37. Coupler Swell to Pedal.
38. Swell Tremolo.
39. Bellows Signal.
40. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Mezzo.
3. Great Piano.
4. Swell Forte.
5. Swell Piano.
6. Pedal Forte.
7. Pedal Piano.
8. Rev. Coup. Great to Pedal.
9. Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XVI.

GREAT MANUAL.

1.	16	ft. tone	Double Open Diapason,	metal	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3.	8	ft. "	Dulciana,	metal	61	"
4.	8	ft. "	Gamba,	metal	61	"
5.	8	ft. "	Doppel Flote,	wood	61	"
6.	8	ft. "	Melodia,	wood	61	"
7.	4	ft. "	Octave,	metal	61	"
8.	4	ft. "	Concert Flute,	wood	61	"
9.	$5\frac{1}{3}$	ft. "	Quint Flote,	metal	61	"
10.	$2\frac{2}{3}$	ft. "	Nasard,	metal	61	"
11.	2	ft. "	Doublette,	metal	61	"
12.	3	ranks	Clear Mixture,	metal	183	"
13.	3	ranks	Acuta Mixture,	metal	183	"
14.	8	ft. tone	Clarinet,	metal	49 or 61	"
15.	8	ft. "	Trumpet,	metal	61	"

SWELL MANUAL.

16.	16	ft. "	Bourdon Bass,	12 wood	61	pipes.
17.	16	ft. "	Bourdon Treble,	49 wood		
18.	8	ft. "	Viola Diapason,	metal	61	"
19.	8	ft. "	Salicional,	metal	61	"
20.	8	ft. "	Æoline,	metal	61	"
21.	8	ft. "	St. Diapason Bass,	12 wood	61	"
22.	8	ft. "	Gedeckt Treble,	49 wood		
23.	4	ft. "	Principal,	metal	61	"
24.	4	ft. "	Violin,	metal	61	"
25.	4	ft. "	Flute Harmonique,	metal	61	"
26.	2	ft. "	Flageolet,	metal	61	"
27.	3	ranks	Echo Mixture,	metal	183	"
28.	8	ft. tone	Cornopæan,	metal	61	"
29.	8	ft. "	Oboe,	49 metal	61	"
30.	8	ft. "	Bassoon,	12 metal		

PEDAL CLAVIER.

31.	16	ft. tone	Open Diapason,	wood	27	pipes.
32.	16	ft. "	Bourbon Sub-Bass,	wood	27	"
33.	$10\frac{2}{3}$	ft. "	Quintolophon,	wood	27	"
34.	8	ft. "	Violoncello,	metal	27	"
35.	4	ft. "	Super-Octave,	metal	27	"
36.	16	ft. "	Trombone,	reed	27	"

MECHANICAL.

37. Coupler Swell to Great.
38. Coupler Great to Pedal.
39. Coupler Swell to Pedal.
40. Swell Tremolo.
41. Bellows Signal.
42. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Mezzo.
3. Great Piano.
4. Swell Forte.
5. Swell Piano.
6. Pedal Forte.
7. Pedal Piano.
8. Reversible Coupler, Great to Pedal.
9. Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XVII.

GREAT MANUAL.

1.	8	ft.	tone	Tibia Major	wood	61	pipes.
2.	8	ft.	"	Open Diapason,	metal	61	"
3.	8	ft.	"	Doppel Flote,	wood	61	"
4.	4	ft.	"	Octave,	metal	61	"
5.	$2\frac{2}{3}$	ft.	"	Octave Quint,	metal	61	"
6.	2	ft.	"	Super Octave,	metal	61	"
7.	3	ranks		Mixture,	metal	183	"
8.	8	ft.	"	Trumpet,	metal	61	"

SWELL MANUAL.

9.	8	ft.	tone	Viola Diapason,	metal and wood	61	pipes.
10.	8	ft.	"	Salicional,	metal	61	"
11.	8	ft.	"	Gedeckt,	wood	61	"
12.	4	ft.	"	Flute Harmonique,	metal	61	"
13.	2	ft.	"	Flageolet,	metal	61	"
14.	8	ft.	"	Oboe and Bassoon,	metal	61	"

CHOIR MANUAL.

15.	8	ft.	tone	Melodia,	wood	61	pipes.
16.	8	ft.	"	Dulciana,	metal	61	"
17.	4	ft.	"	Flute d'Amour,	metal	61	"
18	2	ft.	"	Piccolo,	metal	61	"
19.	8	ft.	"	Clarinet,	metal	49 or 61	"

PEDAL CLAVIER.

20.	16	ft.	tone	Open Diapason,	wood	27	pipes.
21.	16	ft.	"	Bourdon Sub-Bass,	wood	27	".
22.	8	ft.	"	Violoncello,	metal	27	"

MECHANICAL

23. Coupler Swell to Great.
24. Coupler Choir to Great.
25. Coupler Swell to Choir.
26. Coupler Great to Pedal.
27. Coupler Swell to Pedal.
28 Choir to Pedal.
29. Swell Tremolo.
30. Choir Tremolo.
31. Bellows Signal.
32. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Great to Pedal.
4. Adjustable or Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XVIII.

GREAT MANUAL.

1.	16 ft. tone	Tibia Major,	wood	61	pipes.
2.	8 ft. "	Open Diapason,	metal	61	"
3.	8 ft. "	Doppel Flote,	wood	61	"
4.	4 ft. "	Octave,	metal	61	"
5.	4 ft. "	Traverse Flute,	wood	61	"
6.	2⅔ ft. "	Octave Quint,	metal	61	"
7.	2 ft. "	Super Octave,	metal	61	"
8.	3 ranks	Mixture,	metal	183	"
9.	8 ft. tone	Trumpet.	metal	61	"

SWELL MANUAL.

10.	16 ft. "	Bourdon Bass, 12	wood	61	pipes.
11.	16 ft. "	Bourdon Treble, 49			
12.	8 ft. "	Viola Diapason,	metal	61	"
13.	8 ft. "	Salicional,	metal	61	"
14.	8 ft. "	Gedeckt,	wood	61	"
15.	4 ft. "	Violin,	metal	61	"
16.	4 ft. "	Flute Harmonique,	metal	61	"
17.	2 ft. "	Flageolet,	metal	61	"
18.	2 ranks	Echo Mixture,	metal	185	"
19.	8 ft. tone	Oboe and Bassoon,	metal	61	"

CHOIR MANUAL.

20.	8 ft. tone	Melodia,	wood	61	pipes.
21.	8 ft. "	Dulciana,	metal	61	"
22.	4 ft. "	Flute d'Amour,	metal	61	"
23.	2 ft. "	Piccolo,	metal	61	"
24.	8 ft. "	Clarinet,	metal	49 or 61	"

PEDAL CLAVIER.

25.	16 ft. tone	Open Diapason	wood	27	pipes.
26.	16 ft. "	Bourdon Sub-Bass,	wood	27	"
27.	8 ft. "	Violoncello,	metal	27	"
28.	4 ft. "	Super Octave,	metal	27	"

MECHANICAL.

29. Coupler Swell to Great.
30. Coupler Choir to Great.
31. Coupler Swell to Choir.
32. Coupler Great to Pedal.
33. Coupler Swell to Pedal.
34. Coupler Choir to Pedal
35. Swell Tremolo.
36. Choir Tremolo.
37. Bellows Signal.
38. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Grt. to Ped.
4. Adjustable or Balanced Swell Pedal.

Wind Gauge.

SPECIFICATION XIX.

GREAT MANUAL.

1.	16	ft. tone	Tibia Major,	wood	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3.	8	ft. "	Viola da Gamba,	metal	61	"
4.	8	ft. "	Doppel Flote,	wood	61	"
5.	4	ft. "	Octave,	metal	61	"
6.	4	ft. "	Traverse Flute,	wood	61	"
7.	$2\frac{2}{3}$	ft. "	Nasard,	metal	61	"
8.	2	ft. "	Doublette,	metal	61	"
9.	3	ranks	Mixture,	metal	183	"
10.	8	ft. tone	Trumpet,	metal	61	"

SWELL MANUAL.

11.	16	ft. "	Bourdon Bass,	12 wood	61	pipes.
12.	16	ft. "	Bourdon Treble,	49 wood		
13.	8	ft. "	Viola Diapason	metal	61	"
14.	8	ft. "	Salicional,	metal	61	"
15.	8	ft. "	Gedeckt,	wood	61	"
16.	4	ft. "	Violin,	metal	61	"
17.	4	ft. "	Principal,	metal	61	"
18.	4	ft. "	Flute Harmonique,	metal	61	"
19.	2	ft. "	Flageolet,	metal	61	"
20.	3	ranks	Echo Mixture,	metal	183	"
21.	8	ft. tone	Cornopæan,	metal	61	"
22.	8	ft. "	Oboe and Bassoon,	metal	61	"

CHOIR MANUAL.

23.	8	ft. tone	Melodia,	wood	61	pipes.
24.	8	ft. "	Dulciana,	metal	61	"
25.	4	ft. "	Flute d'Amour,	metal	61	"
26.	2	ft. "	Piccolo,	metal	61	"
27.	8	ft. "	Clarinet,	metal	49 or 61	"

PEDAL CLAVIER.

28.	16	ft. tone	Open Diapason,	wood	27	pipes
29.	16	ft. "	Bourdon Sub-Bass,	wood	27	"
30.	$10\frac{2}{3}$	ft. "	Quintolophon,	wood	27	"
31.	8	ft. "	Violoncello,	metal	27	"
32.	4	ft. "	Super-Octave,	metal	27	"

MECHANICAL.

33. Coupler Swell to Great.
34. Coupler Choir to Great.
35. Coupler Swell to Choir.
36. Coupler Great to Pedal.
37. Coupler Swell to Pedal.
38. Coupler Choir to Pedal.
39. Swell Tremolo.
40. Choir Tremolo.
41. Bellows Signal.
42. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Reversible Coupler, Great to Pedal.
4. Adjustable or Balanced Swell Pedal.

Wind Gauge.

SPECIFICATION XX.

GREAT MANUAL.

1.	16	ft. tone	Tibia Major,	wood	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3.	8	ft. "	Viola da Gamba	metal	61	"
4.	8	ft. "	Doppel Flote,	wood	61	"
5.	4	ft. "	Octave,	metal	61	"
6.	4	ft. "	Traverse Flute,	wood	61	"
7.	2⅔	ft. "	Nasard,	metal	61	"
8.	2	ft. "	Doublette,	metal	61	"
9.	3	ranks	Mixture,	metal	183	"
10.	8	ft. tone	Trumpet,	metal	61	"

SWELL MANUAL.

11.	16	ft. "	Bourdon Bass, 12	wood	61	pipes.
12.	16	ft. "	Bourdon Treble, 49			
13.	8	ft. "	Viola Diapason,	metal	61	"
14.	8	ft. "	Salicional,	metal	61	"
15.	8	ft. "	Gedeckt,	wood	61	"
16.	4	ft. "	Violin,	metal	61	"
17.	4	ft. "	Principal,	metal	61	"
18.	4	ft. "	Flute Harmonique,	metal	61	"
19.	2	ft. "	Flageolet,	metal	61	"
20.	3	ranks	Mixture,	metal	183	"
21.	8	ft. tone	Cornopæan,	metal	61	"
22.	8	ft. "	Oboe and Bassoon,	metal	61	"

CHOIR MANUAL.

23.	8	ft. tone	Geigen Principal,	metal	61	pipes.
24.	8	ft. "	Melodia,	wood	61	"
25.	8	ft. "	Dulciana,	metal	61	"
26.	4	ft. "	Flute d'Amour,	metal	61	"
27.	4	ft. "	Celestina,	metal	61	"
28.	4	ft. "	Piccolo,	metal	61	"
29.	8	ft. "	Clarinet,	metal	49 or 61	"

PEDAL CLAVIER.

30.	16	ft. tone	Open Diapason,	wood	27	pipes.
31.	16	ft. "	Bourdon Sub-Bass,	wood	27	"
32.	10⅔	ft. "	Quintolophon,	wood	27	"
33.	8	ft. "	Violoncello,	metal	27	"
34.	4	ft. "	Super Octave,	metal	27	"
35.	16	ft. "	Trombone,	reed	27	"

MECHANICAL.

36. Coupler Swell to Great.
37. Coupler Choir to Great.
38. Coupler Swell to Choir.
39. Coupler Great to Pedal.
40. Coupler Swell to Pedal.
41. Coupler Choir to Pedal.
42. Swell Tremolo.
43. Bellows Signal.
44. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Swell Forte.
4. Swell Piano.
5. Pedal Forte.
6. Pedal Piano.
7. Reversible Coupler, Great to Pedal.
8. Adjustable or Balanced Crescendo Pedal.

Wind Gauge.

SPECIFICATION XXI.

GREAT MANUAL.

1.	16	ft. tone	Double Open Diapason,	metal	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3.	8	ft. "	Gamba,	metal	61	"
4.	8	ft. "	Doppel Flote,	wood	61	"
5.	4	ft. "	Octave,	metal	61	"
6.	4	ft. "	Traverse Flute,	wood	61	"
7.	$5\frac{1}{3}$	ft. "	Quint Flote,	metal and wood	61	"
8.	$2\frac{2}{3}$	ft. "	Nasard,	metal	61	"
9.	2	ft. "	Doublette,	metal	61	"
10.	3	ranks	Clear Mixture,	metal	183	"
11.	3	"	Acuta Mixture,	metal	183	"
12.	8	ft. tone	Trumpet,	metal	61	"

SWELL MANUAL.

13.	16	ft. "	Bourdon Bass,	12 wood	61	pipes.
14.	16	ft. "	Bourdon Treble,	49 wood		
15.	8	ft. "	Viola Diapason,	metal	61	"
16.	8	ft. "	Salicional,	metal	61	"
17.	8	ft. "	Æoline,	metal	61	"
18.	8	ft. "	Gedeckt,	wood	61	"
19.	4	ft. "	Principal,	metal	61	"
20.	4	ft. "	Violin,	metal	61	"
21.	4	ft. "	Flute Harmonique	metal	61	"
22.	$2\frac{2}{3}$	ft. "	Gemshorn, Quint,	metal	61	"
23.	2	ft. "	Flageolet,	metal	61	"
24.	4	ranks	Echo Mixture	metal	244	"
25.	8	ft. tone	Cornopæan,	metal	61	"
26.	8	ft. "	Oboe and Bassoon,	metal	61	"
27.	4	ft. "	Clarion,	metal	61	"

CHOIR MANUAL.

28.	8	ft. tone	Geigen Principal,	metal	61	pipes.
29.	8	ft. "	Melodia,	wood	61	"
30.	8	ft. "	Dulciana,	metal	61	"
31.	4	ft. "	Flute d'Amour,	metal	61	"
32.	4	ft. "	Fugara,	metal	61	"
33.	2	ft. "	Piccolo,	metal	61	"
34.	8	ft. "	Clarinet,	metal	61	"

PEDAL CLAVIER.

35.	16	ft.	tone	Open Diapason,	wood	27	pipes.
36.	16	ft.	"	Dulciana,	wood	27	"
37.	$10\frac{2}{3}$	ft.	"	Quintolophon,	wood	27	"
38.	8	ft.	"	Violoncello,	metal	27	"
39.	8	ft.	"	Flote,	wood	27	"
40.	4	ft.	"	Super-Octave,	metal	27	"
41.	16	ft.	"	Trombone,	reed	27	"

MECHANICAL.

42. Coupler Swell to Great.
43. Coupler Choir to Great.
44. Coupler Swell to Pedal.
45. Coupler Great to Pedal.
46. Coupler Swell to Pedal.
47. Coupler Choir to Pedal.
48. Swell Tremolo.
49. Bellows Signal.
50. Pedal Check.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Swell Forte.
4. Swell Piano.
5. Pedal Forte.
6. Pedal Piano.
7. Reversible Coupler, Grt. to Ped.
8. Balanced Swell Pedal.

Wind Gauge.

Pneumatic Action, applied to the Great Manual Action and Couplings.

SPECIFICATION XXII.

GREAT MANUAL.

1.	8	ft. tone	Double Open Diapason,	metal	61	pipes.
2.	8	ft. "	Open Diapason,	metal	61	"
3	8	ft. "	Gamba,	metal	61	"
4.	8	ft "	Viol d'Amour,	metal	61	"
5.	8	ft. "	Doppel Flote,	wood	61	"
6.	8	ft. "	Clarabella,	metal	61	"
7.	4	ft. "	Octave,	metal	61	"
8.	4	ft. "	Concert Flute,	wood	61	"
9.	$2\frac{2}{3}$	ft. "	Nasard	metal	61	"
10.	2	ft. "	Doublette,	metal	61	"
11.	$5\frac{1}{3}$	ft. "	Quint Flote,	metal	61	"
12.	4	ranks	Clear Mixture,	metal	244	"
13.	3	"	Acuta Mixture,	metal	183	"
14.	8	ft. tone	Trumpet,	metal	61	"

SWELL MANUAL.

15.	16	ft. tone	Bourdon	wood	61	pipes.
16.	8	ft. "	Open Diapason,	metal	61	"
17.	8	ft. "	Salicional,	metal	61	"
18.	8	ft. "	Æoline,	metal	61	"
19.	8	ft. "	Gedeckt,	wood	61	"
20.	4	ft. "	Principal,	metal	61	"
21.	4	ft. "	Violin,	metal	61	"
22.	4	ft. "	Flute Harmonique,	metal	61	"
23.	$2\frac{2}{3}$	ft. "	Gemshorn Quint,	metal	61	"
24.	2	ft. "	Flageolet,	metal	61	"
25.	5	ranks	Echo Mixture,	metal	305	"
26.	8	ft. tone	Vox Humana,	metal	61	"
27.	8	ft. "	Cornopæan,	metal	61	"
28.	8	ft. "	Oboe,	metal	61	"
29.	4	ft. "	Clarion	metal	61	"

CHOIR MANUAL.

30.	16	ft. tone	Still Gedeckt,	wood	61	pipes.
31.	8	ft. "	Geigen Principal,	metal	61	"
32.	8	ft. "	Melodia,	wood	61	"
33.	8	ft. "	Dulciana,	metal	61	"
34.	4	ft. "	Flute d'Amour,	metal	61	"
35.	4	ft. "	Fugara.	wood	61	"
36.	2	ft. "	Piccolo,	metal	61	"
37.	8	ft. "	Clarinet,	metal	61	"

PEDAL CLAVIER.

38.	16	ft.	tone	Open Diapason,	wood	30	pipes.
39.	16	ft.	"	Dulciana,	wood	30	"
40.	16	ft.	"	Violone,	wood	30	"
41.	$10\frac{2}{3}$	ft.	"	Quintolophon,	wood	30	"
42.	8	ft.	"	Violoncello,	metal	30	"
43.	8	ft.	"	Flote,	wood	30	"
44.	4	ft.	"	Super Octave,	metal	30	"
45.	16	ft.	"	Trombone,	metal	30	"

MECHANICAL.

46. Coupler Swell to Great.
47. Coupler Choir to Great.
48. Coupler Swell to Choir.
49. Coupler Great to Pedal.
50. Coupler Swell to Pedal.
51. Coupler Choir to Pedal.
52. Swell Tremolo.
53. Choir Tremolo.
54. Campanula.
55. Pedal Check.
56. Pneumatic to Great.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Swell Forte.
4. Swell Piano.
5. Pedal Forte.
6. Pedal Piano.
7. Coupler, Great to Pedal.
8. Balanced Swell Pedal.

Wind Gauge.

Pneumatic Action to Great and Couplings.

SPECIFICATION XXIII.

GREAT MANUAL.

1.	16	ft.	tone	Double Open Diapason,	metal	61	pipes.
2.	16	ft.	"	Tibia Major,	wood	61	"
3.	8	ft.	"	Open Diapason,	metal	61	"
4.	8	ft.	"	Second Open Diapason,	metal	61	"
5.	8	ft.	"	Gamba,	metal	61	"
6.	8	ft.	"	Viola d'Amour,	metal	61	"
7.	8	ft.	"	Doppel Flote,	wood	61	"
8.	8	ft.	"	Clarabella,	wood	61	"
9.	4	ft.	"	Octave,	metal	61	"
10.	4	ft.	"	Prestant,	metal	61	"
11.	4	ft.	"	Concert Flute,	wood	61	"
12.	$5\frac{1}{3}$	ft.	"	Quint Flote,	metal	61	"
13.	$2\frac{2}{3}$	ft.	"	Nasard,	metal	61	"
14.	2	ft.	"	Doublette,	metal	61	"
15.	5	ranks		Clear Mixture,	metal	305	"
16.	3	"		Acuta Mixture,	metal	183	"
17.	8	ft.	tone	Trumpet,	metal	61	"
18.	4	ft.	"	Clarion,	metal	61	"

SWELL MANUAL.

19.	16	ft.	tone	Bourdon,	wood	61	pipes.
20.	8	ft.	"	Open Diapason,	metal	61	"
21.	8	ft.	"	Viola Diapason,	metal	61	"
22.	8	ft.	"	Salicional,	metal	61	"
23.	8	ft.	"	Æoline,	metal	61	"
24.	8	ft.	"	Gedeckt,	wood	61	"
25.	4	ft.	"	Principal,	metal	61	"
26.	4	ft.	"	Violin,	metal	61	"
27.	4	ft.	"	Flute Harmonique,	metal	61	"
28.	4	ft.	"	Night Horn,	metal	61	"
29.	$2\frac{2}{3}$	ft.	"	Gemshorn Quint,	metal	61	"
30.	2	ft.	"	Flageolet,	metal	61	"
31.	3	ranks		Echo Mixture,	metal	183	"
32.	3	"		Harmonia Ætheria,	metal	183	"
33.	16	ft.	tone	Contra Fagotta,	metal	49 or 61	"
34.	8	ft.	"	Vox Humana,	metal	61	"
35.	8	ft.	"	Cornopæan,	metal	61	"
36.	8	ft.	"	Oboe,	metal	61	"
37.	4	ft.	"	Clarion,	metal	61	"

CHOIR MANUAL.

38.	16	ft.	tone	Lieblich Bourdon,	wood 61	pipes.
39.	8	ft.	"	Geigen Principal,	metal 61	"
40.	8	ft.	"	Melodia,	wood 61	"
41.	8	ft.	"	Stopped Diapason,	wood 61	"
42.	8	ft.	"	Dulciana,	metal 61	"
43.	4	ft.	"	Flute d'Amour	metal 61	"
44.	4	ft.	"	Fugara,	metal 61	"
45.	2	ft.	"	Piccolo,	metal 61	"
46.	8	ft.	"	Clarinet,	metal 61	"

PEDAL CLAVIER.

47.	32	ft.	tone	Double Bourdon,	wood 30	pipes.
48.	16	ft.	"	Open Diapason,	wood 30	"
49.	16	ft.	"	Dolcian,	wood 30	"
50.	16	ft.	"	Violone,	wood 30	"
51.	10⅔	ft.	"	Quintolophon,	wood 30	"
52.	8	ft.	"	Violoncello,	metal 30	"
53.	8	ft.	"	Flote,	wood 30	"
54.	8	ft.	"	Unison Bass,	wood 30	"
55.	4	ft.	"	Super-Octave,	metal 30	"
56.	4	ft.	"	Flute,	wood 30	"
57.	2	ft.	"	Clarina,	metal 30	"
58.	16	ft.	"	Trombone,	metal 30	"
59.	8	ft.	"	Posaune,	metal 30	"

MECHANICAL.

60. Coupler Swell to Great.
61. Coupler Choir to Great.
62. Coupler Swell to Choir.
63. Coupler Great to Pedal.
64. Coupler Swell to Pedal.
65. Coupler Choir to Pedal
66. Swell Tremolo.
67. Choir Tremolo.
68. Campanula.
69. Pedal Check.
70. Pneumatic to Great.

PEDAL MOVEMENTS.

1. Great Forte.
2. Great Piano.
3. Swell Forte.
4. Swell Piano.
5. Pedal Forte.
6. Pedal Piano.
7. Coupler Great to Pedal.
8. Balanced Swell Pedal.

Wind Gauge.

Pneumatic Action applied to Great, Swell and Pedal Clavier.

SPECIFICATION XXIV.

GREAT MANUAL.

1.	16	ft.	tone	Double Open Diapason,	metal	61	pipes.
2.	16	ft.	"	Tibia Major,	wood	61	"
3.	8	ft.	"	Open Diapason,	metal	61	"
4.	8	ft.	"	Bell Diapason,	metal	61	"
5.	8	ft.	"	Gamba,	metal	61	"
6.	8	ft.	"	Viol d'Amour,	metal	61	"
7.	8	ft.	"	Doppel Flote,	wood	61	"
8.	8	ft.	"	Clarabella,	wood	61	"
9.	4	ft.	"	Octave,	metal	61	"
10.	4	ft.	"	Prestant,	metal	61	"
11.	4	ft.	"	Concert Flute,	metal	61	"
12.	4	ft.	"	Hohl Flote,	metal	61	"
13.	5⅓	ft.	"	Quint Flote,	metal	61	"
14.	2⅔	ft.	"	Nasard,	metal	61	"
15.	2	ft.	"	Doublette,	metal	61	"
16.	5	ranks		Harmonic Mixture,	metal	305	"
17.	4	"		Acuta Mixture,	metal	244	"
18.	3	"		Cymbel,	metal	183	"
19.	16	ft.	tone	Bombarde,	metal	61	"
20.	8	ft.	"	Trumpet,	metal	61	"
21.	8	ft.	"	Tuba Mirabalis,	metal	61	"
22.	4	ft.	"	Clarion,	metal	61	"

SWELL MANUAL.

23.	16	ft.	tone	Bourdon,	wood	61	pipes
24.	8	ft.	"	Open Diapason,	metal	61	"
25.	8	ft.	"	Viola Diapason,	metal	61	"
26.	8	ft.	"	Salicional	metal	61	"
27.	8	ft.	"	Æoline,	metal	61	"
28.	8	ft.	"	Quintadena,	metal	61	"
29.	8	ft.	"	Gedeckt,	wood	61	"
30.	4	ft.	"	Principal,	metal	61	"
31.	4	ft.	"	Violin,	metal	61	"
32.	4	ft.	"	Flute Harmonique,	metal	61	"
33.	4	ft.	"	Night Horn,	metal	61	"
34.	2⅔	ft.	"	GemshornQuint,	metal	61	"
35.	2	ft.	"	Flageolet,	metal	61	"
36.	5	ranks		Echo Mixture,	metal	305	"
37.	4	"		Harmonia Ætheria,	metal	244	"
38.	16	ft.	tone	Contra Fagotta,	metal	61	"
39.	8	ft.	"	Vox Humana,	metal	61	"
40.	8	ft.	"	Cornopæan,	metal	61	"
41.	8	ft.	"	Oboe,	metal	61	"
42.	4	ft.	"	Clarion,	metal	61	"

CHOIR MANUAL.

(Enclosed in a separate swell.)

43.	16	ft.	tone	Lieblich Gedeckt,	wood	61	pipes
44.	16	ft.	"	Æolina,	metal and wood	61	"
45.	8	ft.	"	Geigen Principal,	metal	61	"
46.	8	ft.	"	Melodia,	metal	61	"
47.	8	ft.	"	Stopped Diapason,	wood	61	"

48.	8	ft. tone	Rohr Gedeckt,	metal	61	pipes.
49.	8	ft. "	Dulciana,	metal	61	"
50.	4	ft. "	Octave,	metal	61	"
51.	4	ft. "	Fugara,	metal	61	"
52.	4	ft. "	Flute d'Amour,	metal	61	"
53.	4	ft. "	Flauto Traverse,	wood	61	"
54.	$2\frac{2}{3}$	ft. "	Twelfth,	metal	61	"
55.	2	ft. "	Piccolo,	metal	61	"
56.	16	ft. "	Euphone,	Free reed	61	"
57.	8	ft. "	Vox Angelica,	Free reed	61	"
58.	8	ft. "	Clarinet,	reed	61	"

PEDAL CLAVIER.

59.	32	ft. tone	Double Open Diapason,	wood	30	pipes.
60.	16	ft. "	Open Diapason,	wood	30	"
61.	16	ft. "	Principal,	metal	30	"
62.	16	ft. "	Dulciana,	wood	30	"
63.	16	ft. "	Violone,	wood	30	"
64.	$10\frac{2}{3}$	ft. "	Quintolophon,	wood	30	"
65.	8	ft. "	Violoncello,	metal	30	"
66.	8	ft. "	Flote,	wood	30	"
67.	8	ft. "	Unison Bass,	wood	30	"
68.	8	ft. "	Gamba,	metal	30	"
69.	4	ft. "	Super Octave,	metal	30	"
70.	4	ft. "	Flauto,	wood	30	"
71.	2	ft. "	Clarina,	metal	30	"
72.	3	ranks	Harmonics,	wood and metal	90	"
73.	16	ft. tone	Trombone,	metal	30	"
74.	8	ft. "	Posaune,	metal	30	"

MECHANICAJ

75. Coupler Swell to Great.
76. Coupler Choir to Great.
77. Coupler Swell to Choir.
78. Coupler Great to Pedal.
79. Coupler Swell to Pedal.
80. Coupler Choir to Pedal.
81. Swell Tremolo.
82. Choir Tremolo.
83. Campanula.
84. Pedal Check.
85. Great Separation.
86. Pedal Separation.

PEDAL MOVEMENTS.

1. Great Fortissimo.
2. Great Mezzo Forte.
3. Great Piano.
4. Swell Forte.
5. Swell Piano.
6. Pedal Forte.
7. Pedal Piano.
8. Full Couplers.
9. Reversible Coupler Great to Pedal.
10. Adjustable Swell Pedal.
11. Balanced Choir Crescendo Pedal.

Wind Gauge.

Pneumatic Action, applied to each Manual and Pedal Clavier.

SPECIFICATION OF A COLOSSAL ORGAN

FOR A

MUSIC HALL OF THE LARGEST CAPACITY,

With Four Manuals and Thirty-Two Pedal Keys.

GREAT MANUAL.

1.	32	ft.	tone	Sub-Bourdon, from Tenor C°,	wood	49 pipes.
2.	16	ft.	"	Double Open Diapason,	metal	61 "
3.	16	ft.	"	Contra Gamba,	metal	61 "
4.	16	ft.	"	Double-Mouthed Bourdon,	wood	61 "
5.	8	ft.	"	Open Diapason,	metal	61 "
6.	8	ft.	"	Montre Diapason,	metal	61 "
7.	8	ft.	"	Bell Open Diapason,	metal	61 "
8.	8	ft.	"	Rohr Gedeckt,	metal	61 "
9.	8	ft.	"	Bearded Gamba,	metal	61 "
10.	8	ft.	"	Dulciana,	metal	61 "
12.	8	ft.	"	Stopped Diapason,	wood	61 "
12.	8	ft.	"	Clarabella,	wood	61 "
13.	8	ft.	"	Doppel Flote,	wood	61 "
14.	4	ft.	"	Octave,	metal	61 "
15.	4	ft.	"	Principal,	metal	61 "
16.	4	ft.	"	Prestant,	metal	61 "
17.	4	ft.	"	Violina,	metal	61 "
18.	4	ft.	"	Traverse Flute,	wood	61 "
19.	4	ft.	"	Hohl Flote,	metal	61 "
20.	$5\frac{1}{3}$	ft.	"	Quint Flote,	metal	61 "
21.	$5\frac{1}{5}$	ft.	"	Tierce,	metal	61 "
22.	$2\frac{2}{3}$	ft.	"	Octave Quint,	metal	61 "
23.	$2\frac{2}{3}$	ft.	"	Twelfth,	metal	61 "
24.	2	ft.	"	Super Octave,	metal	61 "
25.	2	ft.	"	Fifteenth,	metal	61 "
26.	5	ranks		Clear Mixture,	wood and metal	305 "
27.	5	"		Sesquialtera,	metal	305 "
28.	5	"		Acuta,	metal	305 "
29.	5	"		Cornet.	metal	305 "
30.	5	"		Cymbel,	metal	305 "
31.	16	ft.	tone	Bombarde,	metal	61 "
32.	8	ft.	"	Trumpet,	metal	61 "
33.	8	ft.	"	Posaune,	metal	61 "
34.	4	ft.	"	Clarion,	metal	61 "
35.	2	ft.	"	Octave Clarion,	metal	61 "

SWELL MANUAL.

36.	16	ft.	tone	Double Open Diapason,	metal,	61	pipes.
37.	16	ft.	"	Bourdon,	wood	61	"
38.	8	ft.	"	Open Diapason,	metal	61	"
39.	8	ft.	"	Viola Diapason,	metal	61	"
40.	8	ft.	"	Gamba,	metal	61	"
41.	8	ft.	"	Salicional,	metal	61	"
42.	8	ft.	"	Æoline,	metal	61	"
43.	8	ft.	"	Voix Celestis,	metal	61	"
44.	8	ft.	"	Harmonica,	wood	61	"
45.	8	ft.	"	Quintadena,	metal	61	"
46.	8	ft.	"	Gedeckt,	wood	61	"
47.	4	ft.	"	Principal,	metal	61	"
48.	4	ft.	"	Octave,	metal	61	"
49.	4	ft.	"	Violin,	metal	61	"
50.	4	ft.	"	Flute Octaviante,	metal	61	"
51.	4	ft.	"	Flute Harmonique,	metal	61	"
52.	4	ft.	"	Echo Flute,	wood	61	"
53.	$2\frac{2}{3}$	ft.	"	Nasard,	metal	61	"
54.	$5\frac{1}{3}$	ft.	"	Quint,	wood	61	"
55.	2	ft.	"	Doublette,	metal	61	"
56.	2	ft.	"	Flageolet,	metal	61	"
57.	5	ranks		Harmonic Mixture,	metal	305	"
58.	5	"		Echo Cornet,	metal	305	"
59.	5	"		Harmonic Ætheria	metal	305	"
60.	16	ft.	tone	Euphone,	free reed	61	"
61.	16	ft.	"	Double Trumpet,	metal	61	"
62.	8	ft.	"	Cornopæan,	metal	61	"
63.	8	ft.	"	Cor Anglais,	metal	61	"
64.	8	ft.	"	Oboe,	metal	61	"
65.	4	ft.	"	Clarion,	metal	61	"

CHOIR MANUAL.

(Also enclosed in its own swell box.)

66.	16	ft.	tone	Lieblich Gedeckt,	wood	61	pipes.
67.	16	ft.	"	Æolina,	metal	61	"
68.	8	ft.	"	Open Diapason,	metal	61	"
69.	8	ft.	"	Geigen Principal,	metal	61	"
70.	8	ft.	"	Viol d'Amour,	metal	61	"
71.	8	ft.	"	Dolce,	metal	61	"
72.	8	ft.	"	Melodia,	wood	61	"
73.	8	ft.	"	Flauto Amabile,	wood	61	"
74.	4	ft.	"	Fugara,	metal	61	"
75.	4	ft.	"	Dolcette,	metal	61	"
76.	4	ft.	"	Octave,	metal	61	"
77.	4	ft.	"	Flute d'Amour,	metal	61	"
78.	4	ft.	"	Flute a Chiminee,	metal	61	"

79.	4	ft. tone	Spitz Flute (Pyramidal)	wood	61	pipes.
80.	2	ft. "	Piccolo,	metal	61	"
81.	2	ft. "	Octave Flute,	metal	61	"
82.	$2\frac{2}{3}$	ft. "	Gemshorn Quint,	metal	61	"
83.	5	ranks	Sesquialtera,	metal	305	"
84.	16	ft. tone	Physharmonica,	free reed	61	"
85.	8	ft. "	Clarionet,	metal	61	"
86.	8	ft. "	Trumpet,	metal	61	"
87.	8	ft. "	Vox Angelica,	free reed	61	"
88.	8	ft. "	Musette,	metal	61	"
	8	ft. "	Vox Humana,	metal	61	"

SOLO MANUAL.

89.	16	ft. tone	Tibia Major,	wood	61	pipes.
90.	16	ft. "	Double Melodia,	wood	61	"
91.	8	ft. "	Horn Diapason,	metal	61	"
92.	8	ft. "	Viola,	metal	61	"
93.	8	ft. "	Keraulophon,	metal	61	"
94.	8	ft. "	Dolcan,	wood	61	"
95.	8	ft. "	Philomela,	wood	61	"
96.	4	ft. "	Prestant,	metal	61	"
97.	4	ft. "	Wald Flute,	wood	61	"
98.	4	ft. "	Night Horn,	metal	61	"
99.	4	ft. "	Concert Flute,	wood	61	"
100.	2	ft. "	Harmonic Piccolo,	metal	61	"
101.	6	ranks	Mixture,	wood and metal	366	"
102.	16	ft. tone	Bombardon (reeds),	metal	61	"
103.	8	ft. "	Tuba Mirabilis,	metal	61	"
104.	4	ft. "	Octave Trumpet,	metal	61	"

PEDAL CLAVIER.

105.	32	ft. tone	Sub-Principal,	metal	32	pipes.
106.	32	ft. "	Double Open Diapason,	wood	32	"
107.	32	ft. "	Double Bourdon,	wood	32	"
108.	16	ft. "	Principal,	metal	32	"
109.	16	ft. "	Open Diapason,	wood	32	"
110.	16	ft. "	Bourdon Sub-Bass,	wood	32	"
111.	16	ft. "	Double Dulciana,	wood	32	"
112.	16	ft. "	Gamba,	metal	32	"
113.	16	ft. "	Violone,	wood	32	"
114.	$10\frac{2}{3}$	ft. "	Quintolophon,	wood	32	"
115.	8	ft. "	Violoncello,	metal	32	"
116.	8	ft. "	Dolcissimo,	metal	32	"
117.	8	ft. "	St. Diapason,	wood	32	"
118.	8	ft. "	Principal,	metal	32	"
119.	8	ft. "	Flote,	wood	32	"
120.	8	ft. "	Octave,	metal	32	"
121.	$5\frac{1}{3}$	ft. "	Octave Quint,	wood	32	"

122.	$6\frac{2}{3}$	ft. tone	Terza,	wood	32	pipes.
123.	4	ft. "	Super Octave,	metal	32	"
124.	4	ft. "	Flauto,	wood	32	"
125.	4	ft. "	Gambette,	metal	32	"
126.	2	ft. "	Clarina,	metal	32	"
127.	3	ranks	Mixture,	metal and wood	96	"
128.	5	"	Harmonics,	metal and wood	160	"
129.	32	ft. tone	Bombarde,	reed	32	"
130.	16	ft. "	Tuba,	reed	32	"
131.	16	ft. "	Trombone,	reed	32	"
132.	16	ft. "	Bassoon,	reed	32	"
133.	8	ft. "	Ophycleide,	reed	32	"
134.	8	ft. "	Tromba,	reed	32	"
135.	4	ft. "	Clarion,	reed	32	"

MECHANICAL

136. Coupler Great to Pedal.
137. Coupler Swell to Pedal.
138. Coupler Choir to Pedal.
139. Coupler Solo to Pedal.
140. Coupler Swell to Great.
141. Coupler Choir to Great.
142. Coupler Solo to Great.
143. Coupler Swell to Choir.
144. Swell Tremolo.
145. Choir Tremolo.
146. Great Separation Ventil.
147. Swell Separation Ventil.
148. Pedal Separation Ventil.
149. Pedal Check.
150. Engines.

PEDAL MOVEMENTS.

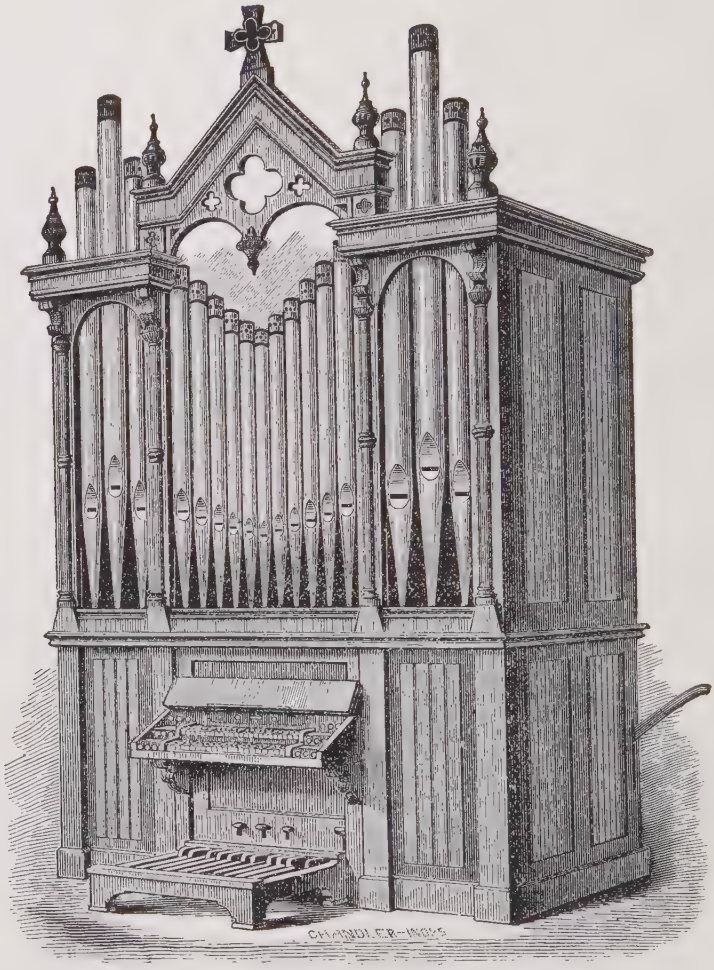
1. Crescendo Pedal for bringing on all stops from the softest to Full Organ, and *vice versa*.
2. Great Forte Composition.
3. Great Mezzo Composition.
4. Great Piano Composition.
5. Swell Forte Composition.
6. Swell Mezzo Composition.
7. Swell Piano Composition.
8. Pedal Forte Composition.
9. Pedal Mezzo Composition.
10. Pedal Piano Composition.
11. Forte Pedal Coupler.
12. Piano Pedal Coupler.
13. Choir Swell Pedal.
14. Swell Crescendo Pedal.

THE preceding schedule contains more than 10,000 pipes.

The Great and Swell Organs would each have three divisions of wind-chests, with varied pressures, and the Choir and Solo Organs would have two divisions, with varied pressures. The Pedal Organ would also have several divisions. Pneumatic composition thumb-knobs between the different manuals over the keys, and pneumatic intervening power introduced at every requisite leverage. An organ of this capacity has not as yet been constructed in any part of the world. It would cost at least $125,000, and would weigh one hundred and seventy-five tons.

IN concluding this *Outline*, it should be understood that an elaborate treatise on the *Details* of the construction of the Pipe-Organ, as pursued in the United States, would necessarily be very expensive, and its sale therefore be so limited that such a work could only be issued by subscription when the number of subscribers would insure the payment of the cost of the plates and numerous engravings. Such a work would contain from six to eight hundred pages, and would require at least five hundred subscribers, with the price of each book at ten dollars. Should such encouragement be received, this volume will be published.

The writer has in preparation the following useful work: "A Guide to Improvisation and Musical Composition, for Organists, containing, in addition to Studies in Harmony, Suggestions in Regard to the Use of Organ Stops, and their Combinations," which will soon be published, and may then be found at the music stores.



THE above engraving represents the exterior of styles of Two-Manual Pipe-Organs, entirely finished and always on exhibition at the Church-Organ Manufactory of Messrs. Wm. H. Clarke & Co., Indianapolis, Ind., in readiness to be set up at once whenever desired. These styles are alike in power and quality, and contain six hundred and sixty-two Speaking Pipes, Pedals of full compass, and twenty Draw-Stops. They are also uniform in price, from which there is no deviation. (See opposite page for description.)

MESSRS. WM. H. CLARKE & CO.

CHURCH ORGAN BUILDERS,

INDIANAPOLIS, IND.,

DESIRE to call the attention of organists and church committees to a style of Two-Manual Pipe-Organ, containing twenty Draw-Stops and six hundred and sixty-two Pipes, and a full set of Pedals of twenty-seven notes, with independent 16 ft. Bourdon sub-bass, which they have constantly on hand for examination at their exhibition room in Indianapolis, Ind. These instruments are made in readiness for churches whose wants are immediate, and can be furnished and set up in the church, if not more than six hundred miles away, within three weeks after receiving the order. The workmanship, scales of pipes, etc., are of the same high class for which the larger instruments of this firm have gained so excellent a reputation. The Wind-Chests are of full size, bellows ample, and the power remarkable, being voiced with copious wind supply for supporting the voices of a large congregation, and yet the soft stops possess rare delicacy and evenness. The expressive capacity is more than is usual in Two-Manual Organs, from the fact of all the Great Manual Stops, excepting the Open Diapason, are also in the Swell-Box. The Open Diapason is of the same scale as in the larger Organs, the longest pipe in front being ten and one-half feet, resting on a bolt six feet from the floor. The case is of neat organ-like design of black walnut with ash paneling, the center rising to a gable point, surmounted by the conventional cross, standing seventeen and one-half feet from the floor, with seventeen large speaking pipes in front. The width is ten feet, and depth six feet three inches; the bellows handle is on the right side. The Pipes ornamented in gold and nickel. While the exterior is attractive and imposing it is the rare musical capacity and variety of combination which cause them to be of superior artistic value. The intentional omission of Reed Pipes, which require frequent tuning, is a guarantee that these instruments will need but little tuning for many years, thus rendering them especially serviceable to remote churches. A competent man is sent with each of these instruments to attend to the setting up and tuning. The weight of one of these organs is about six thousand pounds, or three tons. Further description will be given in special correspondence. The specification is as follows:

Compass of Manuals from C_0 to c^4	61 notes.
Compass of Pedals from C_0 to D	27 "
Total number of pipes	662
Total number of draw-stop knobs	20

LOWER MANUAL.

1.	8	ft.	tone	Open Diapason, lower pipes in front, metal	61	pipes.
2.	8	ft.	"	Dulciana, from C° in metal	49	"
3.	8	ft.	"	St. Diapason Bass, wood	12	"
4.	8	ft.	"	Melodia Treble, wood	49	"
5.	4	ft.	"	Octave, metal	61	"
6.	$2\frac{2}{3}$	ft.	"	Octave Quint, metal	61	"
7.	2	ft.	"	Super Octave, metal	61	"

UPPER MANUAL.

8.	16	ft.	tone	Manual Bourdon, from C° in wood	49	pipes.
9.	8	ft.	"	Unison Bass, wood	12	"
10.	8	ft.	"	Gedeckt Treble, wood	49	"
11.	8	ft.	"	Salicional, from C°, metal	49	"
12.	4	ft.	"	Flute Octaviante, metal	61	"
13.	2	ft.	"	Flageolet, metal	61	"

PEDAL CLAVIER.

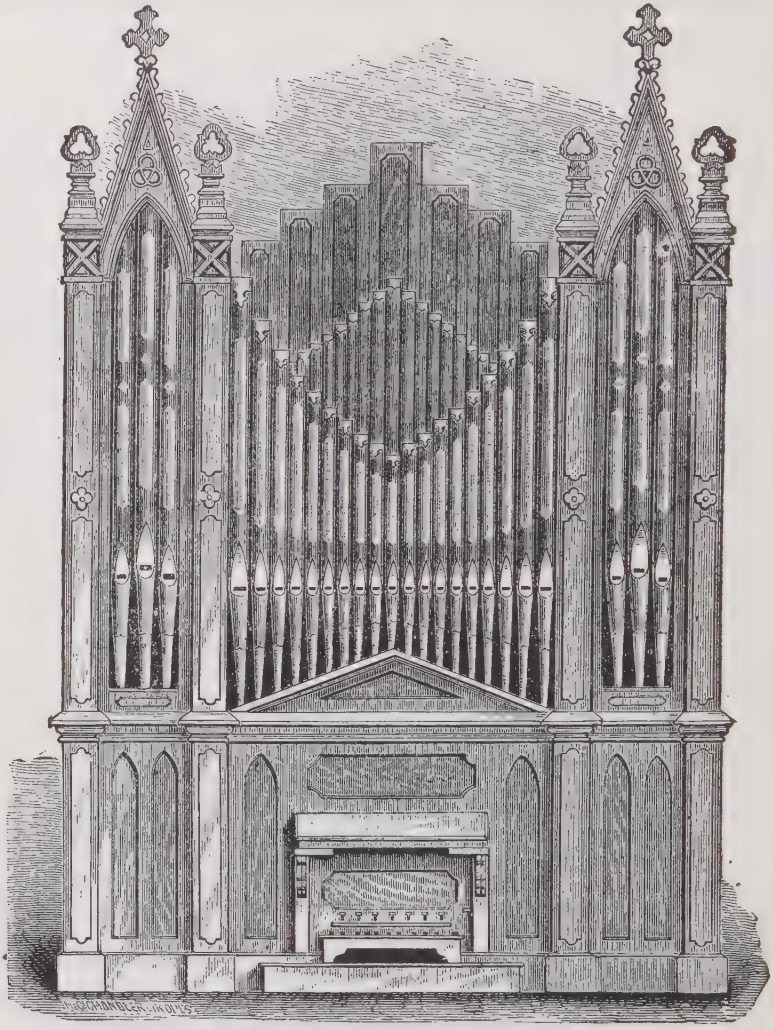
14.	16	ft.	tone	Bourdon Sub-Bass, wood	27	pipes.

MECHANICAL.

15. Coupler Lower Manual to Ped.
16. Coupler Upper Manual to Ped.
17. Manual Coupler.
18. Tremolo.
19. Bellows Signal.
20. Pedal Check.

COMPOSITION PEDALS.

1. Forte.
2. Piano.
3. Reversible Coupler, Lower Manual to Ped.



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PIPE-ORGAN BUILDERS,

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Possessing extensive facilities for executing first class work in building Organs of every size, employing workmen of long practical experience, and referring to instruments of large musical capacity, made by them in the West.

Repairing of old Organs faithfully executed by competent men.

Water motors furnished and attached.

Correspondence will receive immediate attention. P. O. Box 119.

For financial responsibility to fulfill contracts of any value, reference is made by permission to Messrs. S. A. FLETCHER & Co., Bankers, Indianapolis, Ind.

REFERENCES.

Among many testimonials the following are inserted from Churches possessing Organs of Two and Three-Manual capacity, built by Messrs. Wm. H. Clarke & Co., of Indianapolis, Ind. Although their Single-Manual Organs are built with the same care, and have the same characteristic qualities as their larger instruments, yet a Single-Manual Organ is of a too limited capacity to be a representative instrument.

ROBERTS PARK M. E. CHURCH, INDIANAPOLIS.

A large Three-Manual Organ, containing 60 Draw-Stops, including 10 Pedal Registers, and is supplied with wind by Hydraulic power.

INDIANAPOLIS, Feb. 17, 1877.

MESSRS. W. H. CLARKE & CO.—*Gentlemen:* The large Organ you built for Roberts Park M. E. Church, in this city, does more than give perfect satisfaction. Its excellencies, as they are developed from Sabbath to Sabbath, are a constant surprise. Its praise is on the lips of all who hear it. It is an invaluable help to the service of praise, and in leading the congregation in song. It draws many lovers of music to the sanctuary. In our opinion it has no superior, and in this judgment several competent critics, who have heard the best instruments, both in Europe and America, have agreed, and we invite those who are about to contract for Organs to examine it. Sincerely yours,

G. DE LA MATYR, *Pastor of R. P. M. E. Church.*
L. ABBETT, *President of Board of Trustees.*
W. L. HEISKELL, *Chairman of Organ Committee.*

FIRST BAPTIST CHURCH, INDIANAPOLIS.

A large Three-Manual Organ, containing 52 Draw-Stops, with Pneumatic Action. Baptistery in the Organ, and Key-Desk in the body of the Church front of pulpit, operated by Hydraulic power.

INDIANAPOLIS, IND., JAN. 19, 1875.

MESSRS. WM. H. CLARKE & CO.—*Organ Builders, Indianapolis, Ind.—Gentlemen:* In accepting this Organ, in behalf of the First Baptist Church of Indianapolis, we can not forbear to express to you our full satisfaction with the manner in which your contract with us has been fulfilled, both as to time and specifications.

The Organ itself bears ample testimony to the fact, that your standard for workmanship is of the highest order. In mechanical construction it is simply a model, while the wonderful effects produced by the noble instrument, when called forth by a master hand, sufficiently attest the rare musical genius which conceived and governed the entire work. It will stand in this sanctuary a monument of high art, grandly worthy to be used for the sacred purposes to which it is solemnly dedicated.

S. C. HANNA, JNO. A. FURGASON, M. A. WOOLEN, JR.,
E. C. ATKINS, D. V. BURNS, ALEX. SHALLENBERGER,
A. A. BARNES, EDGAR J. FOSTER, H. C. MARTIN,
Trustees First Baptist Church, Indianapolis, Ind.

FROM RT. REV. JOS. C. TALBOT, BISHOP OF THE DIOCESE OF INDIANA.

INDIANAPOLIS, FEB. 26, 1877.

I take pleasure in expressing my entire confidence in the superior abilities of Messrs. Wm. H. Clarke & Co. as Organ-builders, and in their faithfulness and integrity as business men.

JOS. C. TALBOT, *Bishop of Indiana.*

CHURCH OF THE MESSIAH (UNITARIAN), LOUISVILLE, KY.

A divided Transept Organ, with elaborate case, containing 33 Stops, Semi-Reversed Action, and blown by Hydraulic power.

LOUISVILLE, KY., FEB. 7, 1877.

THE undersigned, members of the Organ Committee of the Church of the Messiah, of Louisville, Kentucky, respectfully submit the following statements for the benefit of whom it may concern:

When we commenced our investigations of Organs and Organ builders, we sent carefully prepared specifications and drawings to eight firms in different parts of the country. Six of them were of acknowledged reputation, as ranking among the most eminent of the present day, and as having reputations co-extensive with civilization. Having some distrust of the other two firms (including Messrs. Clarke & Co.), based upon their limited experience, we continued our researches and correspondence for several months, and at the same time we made personal examinations of the Organs built by the various firms with which we were in correspondence. This enabled us to draw more intelligent conclusions than we could otherwise have arrived at; and our unanimous opinion was that the Messrs. Clarke & Co., of Indianapolis, were producing instruments equal in every respect to those of any builders in this country; that Mr. Wm. H. Clarke, possessing as he does, superior attainments as an organist, is eminently qualified to judge of the acquirements of an Organ for any place in which it is desired to place it, and his artistic tastes lead him to the most satisfactory results in construction, combination, voicing and general effect.

Messrs. Clarke & Co. are gentlemen of unquestionable honesty and veracity, and we believe will fulfill in spirit and to the letter any contracts they may undertake. The Organ furnished by them for this Church, is characterized by great power of tone, yet each Stop has an individuality that is not lost in combination. The materials, mechanism, and workmanship of the instrument are of the highest degree of excellence, and the whole effect pleasing and satisfactory. We take great pleasure in commending Messrs. Clarke & Co. and their Organs to the favorable notice of the public in general, and particularly to any Church or society contemplating the purchase of an Organ.

M. M. GREEN,
C. J. KENT,
CHAS. HERMANY,
Organ Committee.

FIRST PRESBYTERIAN CHURCH, DAYTON, OHIO.

DAYTON, OHIO, FEB. 1, 1877.

MESSRS. WM. H. CLARKE & CO.—*Gentlemen:* At the time our fine Organ, of thirty Stops, was built by you, and erected in the First Presbyterian Church of this city, in 1874, I expressed to you my entire approbation of the character of the work, which was in faithful agreement with the details of your contract. In regard to its musical qualities, it was pronounced by good judges to be superior to any other instrument in Dayton, and its good reputation was maintained until its recent destruction by fire—a loss to our society which we feel will be quite difficult to replace with a more satisfactory instrument.

Respectfully yours,

JOHN W. STODDARD, *President Board of Trustees First Presbyterian Church.*

CALVARY CHURCH (EPISCOPAL), LOUISVILLE, KY.

An instrument containing Two Manuals, 40 Stops, located by the Chancel, with Reversed Action, and operated by Hydraulic power.

LOUISVILLE, KY., FEB. 15, 1877.

MESSRS. WM. H. CLARKE & CO., *Organ Builders—Gentlemen:* It gives me pleasure to certify as to the manner in which you have acquitted yourselves in building the Organ for Calvary Church. You have not only come up fully to your written contract, but have inserted additions desired by me not specified; and, although I expected a very superior instrument, you have indeed surpassed my highest expectations, and I may say, without fear of contradiction, that you certainly are artists in Organ building in the fullest sense of the word, desiring above all to give a perfect instrument.

The mechanical part is as near perfection as possible, the touch easy and prompt; not a single key has stuck since you put it up last October, although the weather has been quite damp. The Pedal Organ is solid in power, the Pedal Keys as easy of touch and as prompt as the Manuals, but the great beauty of the instrument is in the voicing, each Stop being a perfect imitation of the orchestral instruments intended to be represented. In this respect it stands unrivalled. The Diapasons and all the Stops are full and round, without being noisy, so that I can use the full Organ of forty Stops for a double quartette, and yet so distinct that the softest Stop will lead the voices in delicate passages. The Reeds are the best I ever heard in an Organ, having played on them four months without tuning them, using them frequently for solo combinations.

I therefore consider your Organs as ranking with the very best in the country, which leave nothing further to be desired, and I would add that I would not hesitate to have you build an Organ for me without a written contract, depending entirely on your word as gentlemen. I also find your new Hydraulic Motor perfectly satisfactory and very convenient.

Hoping that you may be as successful in your business as you deserve, I have the honor to remain, Respectfully yours,

W. PLATO, *Organist Calvary Church, Louisville, Ky.*

FOURTH PRESBYTERIAN CHURCH, INDIANAPOLIS.

INDIANAPOLIS, FEB. 14, 1877.

MESSRS. WM. H. CLARKE & CO.—*Gentlemen:* The Church Organ built in your factory about three years ago, and placed in the Fourth Presbyterian Church of this city, has, I am pleased to say, given entire satisfaction. In purity and volume of tone, perfection of finish, ease and promptness of action, it is a noble instrument, worthy to lead the congregation in the service of song. Permit me to add that I have seen a number of your Organs, large and small, and am much pleased with them. Long may you live, and many organs may you build.

Yours truly,

E. B. MASON, *Pastor Fourth Presbyterian Church.*

FIRST CONGREGATIONAL CHURCH, KOKOMO, IND.

KOKOMO, IND., FEB. 1, 1877.

MESSRS. WM. H. CLARKE & CO.—*Gentlemen:* The Pipe Organ built for us by your firm, in 1875, has given satisfaction both in musical value and price, and we deem the money to have been well expended. The organ is sweet and powerful in tone, and the mechanical action is excellent. We can endorse your firm to any church desiring a *thoroughly* made and *permanently* good Organ. Your contract was fulfilled to the letter.

Yours sincerely,

ABEL S. WOOD, *Pastor First Congregational Church.*

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An outline of the structure of the pipe organ